...ne Library
MAY 14 1946

the OIL AND GAS JOURNAL

...WITH *Hughes* ROCK BITS

more footage per bit . . . fewer round trips!

For faster, straighter, full-gage hole . . . Specify Hughes Rock Bits to save time and money. For over 35 Years Hughes Rock Bits have been constantly improved to provide more for your drilling dollar.

Hughes TOOL COMPANY HOUSTON, TEXAS

Standard of the Industry

PRICE 20 CENTS

TABLE OF CONTENTS PAGE 65

MAY 11, 1946

Craftsmanship

in

STEEL

You cannot write a specification that will assure you of getting the *plus values* that are automatically built into the structure when you come to Chicago Bridge & Iron Company for steel plate work. Each job is handled by skilled, qualified workmen under rigid inspection. And, while there are numerous prescribed standards governing the fabrication of various types of work, there is only one Chicago Bridge & Iron Company standard of workmanship—the BEST!

• *The pressure vessel shown above is an 11-ft. diam. by 84-ft. bubble tower fabricated at our Birmingham, Alabama, plant for an Oklahoma refinery.*

builders of

depropanizer towers ○ debutanizer columns ○ regenerator towers ○ stabilizer columns refinery drums ○ pressure cylinders ○ retorts ○ vacuum stills ○ cracking chambers catalytic towers . . . and vessels to meet all kinds of engineering specifications

CHICAGO BRIDGE & IRON COMPAN

BIRMINGHAM • CHICAGO • CLEVELAND • NEW YORK • PHILADELPHIA • SAN FRANCISC
LOS ANGELES • DETROIT • HOUSTON • TULSA • WASHINGTON • ATLAN

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PENNSYLVANIA

the OIL AND GAS JOURNAL

published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE AVE., TULSA 1, OKLAHOMA

FOUNDED IN 1910 BY PATRICK C. BOYLE

Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Note: Payments from outside the U. S. A. may be in the form of an international money order or check on a U. S. A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

Copyright 1946 by The Petroleum Publishing Co.

Vol. 45, No. 1 May 11, 1946

P. C. LAUINGER, *President* — C. O. WILLSON, *Editor*

S. H. ROURKE, *Business Manager* — H. STANLEY NORMAN, *Managing Editor*

R. C. MAC DOUGALL, *Circulation Manager* — KENNETH B. BARNES, *Engineering Editor*

W. L. NELSON, *Technical Editor* — ARCH L. FOSTER, *Refining Editor*

PAUL REED, *Pipe-Line Editor*

Associate Editors

LYNN M. NICHOLS — NEIL WILLIAMS

CHARLES J. DEEGAN — R. B. TUTTLE

D. H. STORMONT

District Editors

HERNDON DAVID, Tulsa 1, *211 S. Cheyenne Ave.* — DAHL M. DUFF, Tulsa 1, *211 S. Cheyenne Ave.*

TOLBERT R. INGRAM, Denver 11, *4556 Alcott St.* — E. H. SHORT, JR., Houston 2, *Sterling Bldg.*

HENRY D. RALPH, Washington 4, *Natl. Press Bldg.* — L. P. STOCKMAN, Los Angeles 14, *Union Oil Bldg.*

FABIAN R. STALEY, New York 17, *415 Lexington* — WARREN W. BURNS, New York 17, *415 Lexington*

VICTOR LAURISTON, Chatham, Ont., *35 Stanley Ave.* — O. C. PRESSPRICH, Saginaw, *News Bldg.*

GEORGE H. WEBER, Dallas 1, *913 S. St. Paul St.*

Advertising

WAYNE RIVES, *Manager*

KENNETH J. LANGLEY, *Eastern Manager*, New York 17, *415 Lexington Ave.* — CHARLES A. WARDLEY, *Pittsburgh Manager*, Pittsburgh, *435 Fourth Ave.*

C. R. FARMER, *Chicago Manager*, Chicago 2, *105 W. Madison* — J. HOWARD TINKHAM, *California Manager*, Los Angeles 15, *1406 S. Grand Ave.*

J. V. PENNINGTON, *Gulf Coast Manager*, Houston 2, *Sterling Bldg.* — A. J. CHAMBERS, Beckenham, *Kent, England*, *33, The Avenue*

MITCHELL TUCKER, *Manager, Research Dept.*, Tulsa 1, *211 S. Cheyenne Ave.* — JOHN D. REILLY, *Production Manager*, Tulsa 1, *211 S. Cheyenne Ave.*

Member Audit Bureau of Circulations Associated Business Papers

Table of Contents

NEWS DEVELOPMENTS

PAW Dissolved; Krug Creates Oil and Gas Division 68
Davies Leaves California Standard, Plans Not Announced .. 69
Industry Groups Press for Removal of Price Controls 69
Heroy Cites Five-Point Program for Maintaining Reserves .. 70
Gas Industry Urged to Resist Further Federal Regulation 72
Independents Demand OPA Make Good Its Promise on Oil .. 73
Flow of N.E.I. Oil Awaits Political-Situation Settlement 76
Plans Disclosed for Merger of Sunray and Transwestern ... 84
Cities Service Planning Construction Program 84
Housebrand Gasoline Price Up Eighth Cent 85
Deaths in the Industry 85
What Others Say 86
Statistics and Trends 148

Editorial 67
This Week 71
International News 74
Watching Washington ... 79
Refining News 137
Pipe-Line News 141
Natural-Gas News 145
Natural-Gasoline News .. 145

ENGINEERING AND OPERATING

Oil-Pool Analyzer 90
Venezuela's Largest Chemical Emulsion Treating Plant 93
Engineering Refinements Feature New Heavy Rig 95
Desulfurization and Superfractionation 99
Safe Field Practices: Avoiding Gas-Engine Injuries 107
Questions on Technology 108
Trends in Processing Gas-Condensate Reservoirs 111
Polytreating Eliminates Olefin; Forms Aromatic Hydrocarbons 115
Lube Oils Classified as to Duty Requirements 115
Water-Base Muds—A Review of Developments 117
Oil and Gas Equipment Digest 131

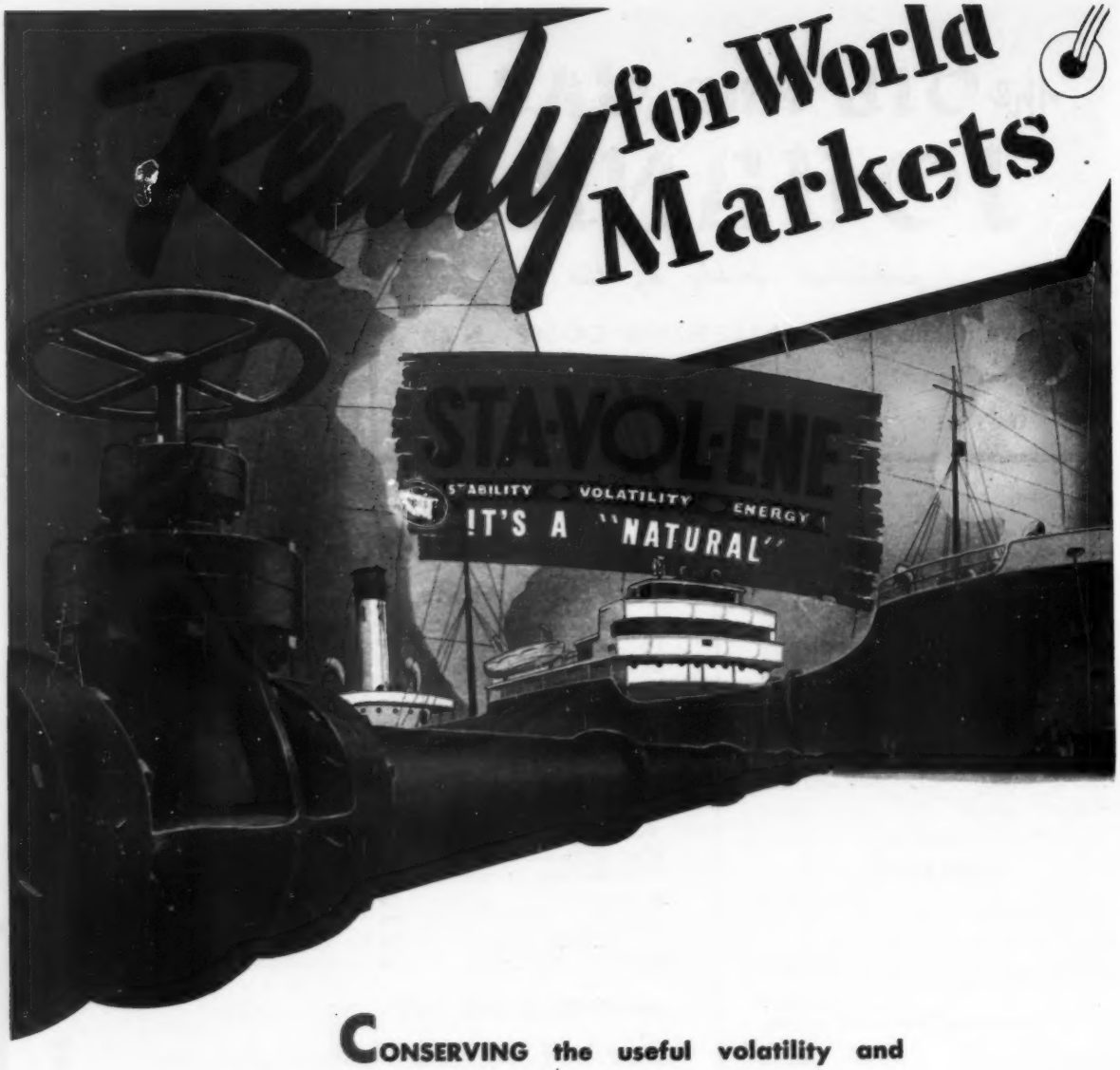
Plant Practices 110
Book Reviews 115
The Refiner's Notebook .. 123
Engineering Fundamentals 125

EXPLORATION AND DRILLING

Weekly Well-Completion Record 148
Daily Average Production for Week 149
Florida Chances Improve 151
Reports by Areas Start on Page 151

ADDITIONAL FEATURES

Market Summary 148
Crude-Oil Prices 148
Calendar of Events 169
Drilling Contractors 170
Personals 172
Equipment Men in News 174
Classified Advertising ... 175
Advertisers' Index 178



CONSERVING the useful volatility and energy of natural gasoline — STA-VOL-ENE is the "Natural" component of motor fuels, available immediately for peace time cargoes to World Markets.

Hanlon-Buchanan, Inc

PIONEER NATURAL GASOLINE MANUFACTURER

EXPORT TERMINALS:
Goodhope, La. Corpus Christi, Tex.
Houston, Texas Galveston, Texas
Beaumont, Texas Port Arthur, Texas

TULSA, OKLAHOMA
NATIONAL BANK OF TULSA BUILDING
Phone ATlantic 358 Wire Line WRITE P. O. BOX 1559
Cable Address STAVOLENE Tulsa, U. S. A.

FOREIGN REPRESENTATIVE:
Rowe, Williams & Co., Ltd.
4 Lloyd's Ave.
London, England

Science lib.
Wabash

THE OIL AND GAS JOURNAL

Suspension Not Enough

WASHINGTON reports indicate that the suspension of the oil industry's price controls under the provision of the stabilization acts may materialize soon. It is certain that the industry's advisory committees at Chicago last week answered every remaining question of the OPA fuels division as to its preparedness to carry out all obligations to consumers.

But there are those, not only in this industry but in others, who are concerned of what may happen with a suspension of price regulations. They fear a trap is being set by those who are giving up war powers reluctantly and who are looking forward to a peacetime economy permanently controlled from the nation's capital.

The danger in suspension is that all or part of the regulations can be resumed at the discretion of the Economic Stabilization Director. All the existing statutes are general in their terms and OPA officials have stressed the fact that price controls, in industries in which they have been suspended, can be resumed if they deem such action advisable.

Thus, in effect, OPA is in a position to continue to exercise its control powers from the start of the suspension period. Based on past actions it would be more concerned with the possible political reactions from the inevitable repercussions of the adjustment period than it would be in permitting the free establishment of sound price levels.

The advisory committees at Chicago were correct in their assurance that increases in the cost of producing and refining crude oil and distributing products can be offset without danger of runaway markets. But neither they nor any one knows exactly what price changes will materialize in shifting from a controlled to a free economy.

Over the past 4½ years there have been major developments in manufacturing methods and quality of products. Production, transportation, and distribution operations have also changed. Demands have expanded with emphasis, since the close of the war, on intermediate and residual products. In normal times prices would have adjusted slowly to these altered conditions, some of which would not have materialized but for the war.

So suspension is a step in the right direction but permanent decontrol through legislative action is the final answer. Only with this assurance can operators get their house in order for the many tasks ahead. As to the position of the consumer we quote a sentence from the Chicago advisory report: "Give the industry freedom to work out those problems without the shackles of governmental price control and it is our firm belief that it will find ways and means in the future, as in the past, of supplying the entire petroleum market at price levels which will continue to be lower than those reflected by the index generally as published by the Department of Labor."

PAW Dissolved; Krug Creates Oil and Gas Division

by Henry D. Ralph

WASHINGTON. — The Petroleum Administration for War was officially terminated May 8 by order of President Truman and Secretary of the Interior J. A. Krug was directed to wind up its affairs.

At the same time the president directed Krug to take steps to coordinate the Government's interests in petroleum and natural gas, including proposals for transfer of functions from one department to another.

Secretary Krug complied with the President's request immediately by creating an Oil and Gas Division in the Interior Department, incorporating what is left of PAW—about 25 people—and also the former Petroleum Conservation Division which administers the Connally hot oil act.

Operating functions of other Interior Department bureaus have not been transferred to the division, but the new division is to coordinate their policies, and will also attempt to work closely with other federal agencies on oil matters. Krug said that petroleum problems have arisen during the reconversion period and the new agency will give them immediate attention with a view to developing appropriate solutions in cooperation with other interested agencies and with the petroleum industry.

New Director Not Chosen

A director has not yet been selected for the new division, but Ralph K. Davies will remain with the department for a brief period to assist in getting it organized.

Principal functions of the new oil and gas division will be to:

1. Assist the secretary in the execution of the President's instructions to:

(a) Coordinate and unify policy and administration in respect to the functions and activities relative to oil and gas carried on by the several departments and agencies of the federal Government;

(b) Serve as channel of communication between the federal Government and the petroleum industry;

(c) Serve as liaison agency of the federal Government in its relations with the appropriate state oil and gas bodies; and

(d) Review technological developments in the field of petroleum and synthetic hydrocarbon fuels and coordinate federal policy with respect thereto.

2. Obtain and analyze information as to oil and gas matters in which the federal Government has a proper interest and, in this connection, serve as the central federal clearing house for statistics, technical data, and other information relating to oil and gas.

3. Keep the secretary informed with respect to the adequacy and availability of supplies of petroleum and its products to meet the current and future needs of the nation, and with respect to significant developments in the petroleum field, and make recommendations with respect thereto.

4. Develop proposals looking to the centralization of federal functions and activities relating to oil and gas in keeping with the President's letter.

5. Coordinate all oil and gas policies and activities in the Department of the Interior.

An industry advisory committee, which will probably be named the National Petroleum Council, is being created, and invitations to serve on this will be issued shortly if the Department of Justice gives legal approval to the scheme. The composition and members of this new council probably will be somewhat like those of the Petroleum Industry War Council, and in any event will seek to represent all sections of the industry and all geographical regions. Particular pains will be given to providing adequate representation to independent operators.

President Truman's letter to Secretary Krug, which was included in the White House announcement May 3, follows:

Truman's Letter

"My dear Mr. Secretary: In keeping with the Administration's policy of winding up the affairs of war agencies as quickly as possible after their emergency responsibilities have been discharged, I have acted upon your recommendation to terminate, effective May 8, the Petroleum Administration for War, which has so successfully completed its wartime assignment.

"I am in agreement with your views that steps should now be taken to assure coordination in peacetime of the federal Government's many interests in petroleum, petroleum products, and associated hydrocarbons.

"To the extent possible one agency must bear the primary responsibility for providing a focal point for leadership and information for the numerous agencies of the federal Government dealing with petroleum. I, therefore, request that you undertake the initiative in obtaining coordination and unification of federal policy and administration with respect to the functions and activities relating to petroleum carried on by the various departments and agencies. Where practicable and appropriate governmental activities relating to petroleum should be centralized, and I ask that from time to time you submit to me for consideration proposals looking to the accomplishment of this objective.

"You should, through such office as you designate, serve as the channel of communication between the federal Government and the petroleum industry, and as the liaison agency of the federal Government in its relations with appropriate state bodies concerned with oil and gas. I have been impressed with the great contribution of government-industry cooperation to the success of the war petroleum program, and feel that the values of such close and harmonious relations between Government and industry should be continued. I, therefore, suggest that you establish an industry organization to consult and advise with you.

Suggests Davies Remain

"In this connection, I think it would be most helpful if Mr. Ralph K. Davies, deputy petroleum administrator throughout the war, were to remain on for a brief period to assist in organizing and launching these activities and to supervise winding up the affairs of the Petroleum Administration. Mr. Davies possesses a broad experience in oil, and enjoys a high standing both within Government and within the petroleum industry. I believe that his participation would assure the full cooperation and support that is so essential in the initial phase.

"I need not emphasize to you the importance of petroleum in the life of the nation and the consequent necessity for assuring the adequate and continuous availability of this vital resource. You are requested to keep me informed concerning significant developments in the petroleum field, and to consider and recommend such steps as may be necessary appropriately to safeguard our petroleum future.

"Copies of this letter are being sent to the Secretaries of State, War, Navy, and Commerce, for their information and guidance. I am sure you will find them ready to cooperate fully.

"Very sincerely yours,

"HARRY S. TRUMAN."

Davies Leaves California Standard; Future Plans Not Announced

HAROLD L. ICKES, former secretary of the interior, put in an appearance last week at a stockholders' meeting of Standard Oil Co. of California, but the issue he was prepared to champion—reinstatement of Ralph K. Davies as vice president—melted when Davies announced his resignation from the company.

In Washington, Davies' office confirmed his resignation from California Standard. Davies, who has been asked to remain "for a brief period" to aid in organizing the new oil and gas division in the Department of the Interior, said he intended to put a literal interpretation on the president's request and figures he will be in Washington only a very few weeks.

Then, he will start on a long—very long, he said—vacation at his summer home on the shore of Lake Tahoe which he has not seen for 5 years. Beyond that, Davies said he had no plans at all for the future. He insists his resignation from Standard of California was sincere and unequivocal, even though he felt he was forced into it by the activity of his friend, Ickes.

Davies denied that Ickes acted in his behalf when he demanded that he be reinstated to a better job than mere vice president. He knew Ickes had become a stockholder and when he learned Ickes was at the meeting, he suspected something and sent his resignation because he didn't want to be the cause of a fight which might disrupt the company.

Ickes under whom Davies worked in PAW, used 10 shares of stock he bought last December to qualify himself for the San Francisco stockholders' meeting. He brought a prepared statement but declined to read it because he said he had received the wire from Davies disclosing his resignation.

Before leaving the meeting, the former secretary of the interior made several barbed remarks and announced he would take up his fight "in another forum." Ickes was accompanied by Thurman Arnold, former head of the antitrust division of the Department of Justice as his counsel.

Another object of Ickes appearance was to battle what he termed "absentee control" of the company. He asked for the floor before the meeting was opened, and Chairman H. D. Collier asked him to wait, assuring him he would be given an opportunity to talk.

Collier then announced all speakers would be limited to one speech. This prompted Ickes to remark when he had the floor that "fortunately I am not affected by the gag rule arbitrarily announced by the chairman" since he had decided not to make the statement he had brought along. He would, he added, "protest as a citizen that this great company should meekly submit to absentee control." He then stalked out of the meeting.

After his departure, several stockholders spoke critically of the imputation against the management. A resolution of confidence was offered. It was passed by the stockholders without a negative vote.

The attendance at the meeting was about 10 times as large as usual, since the fact that Ickes would appear was known. About 300 were present, and the meeting was open to the press.

The issue seemed to center on the position to which Davies was expected to return. R. G. Follis, California Standard president, said Davies would return as vice president and director, but Ickes, terming this statement "slightly evasive," said Davies should go back to his "old job of senior vice president." A company official later said there had never been any such office. Davies, he added, was drafted from the company in June 1941 to serve in PAW. The company said it made up the difference between Davies' $57,000 a year salary as a vice president and the $10,000 he drew from the Government.

Davies' wire to Ickes read: "I am transmitting my resignation to the president of the company. I appreciate deeply your goodwill in going to San Francisco to represent a cause which you believe to be right and just. I would rather resign altogether than that anything take place which might jeopardize the interests of the company with which I have been associated for so many years."

Industry Groups Press for Removal Of Price Controls on Oil

CHICAGO.—The membership of the National Crude Oil Advisory Committee and the National Refiners Advisory Committee meeting here May 3 and 4 again presented the oil industry's case to the Office of Price Administration's fuel division looking to the ending of all price regulations. Charles F. Roeser, independent operator of Fort Worth, and C. L. Henderson, president of Vickers Petroleum Co., Wichita, are chairmen of the two committees. J. H. Reppert, who has succeeded Sumner T. Pike as administrator of the fuels division, presided at the sessions and explained that the division wished to have several questions answered by the committees preliminary to a final decision regarding the adoption of a price-control program.

Answering the question as to whether the industry had adequate supplies for present and future requirements, the industry's committees presented data which showed that both production and refinery capacities were sufficient for anticipated needs. This reply was coupled with another which emphasized that there is sufficient flexibility in refinery processing to supply the varying seasonal and extraordinary demands for products.

In regard to the question as to the probable reaction of crude-oil prices to a suspension of controls the report, after outlining increased operating costs, stated: "We feel that the average price of crude oil could advance at least 25 cents per barrel as recommended by PAW and congressional committees, and would still be well within the pattern of price increases already established for practically all other basic raw materials."

Regarding the probable advances in prices of products, the committee pointed out that for every 10-cent advance in crude-oil prices there should be an advance of at least ¼ cent per gallon in product quotations. It was explained that this increase cannot be uniform because of the "byproduct" nature of some products which are sold in competition with other fuels.

Refinery raw materials and operating costs, it was explained, have increased about 35 cents per barrel since 1941 and product ceilings have increased 12 cents per barrel of crude run, so that about 21 cents per barrel of cost is yet to be reflected in prices.

The final question of OPA representatives had to do with the possibility that a suspension of price controls might result in abnormal price increases in certain products with particular reference to fuel oil. Re-

garding this possible development, the report stated:

"While the committee is in favor of removal of price controls on all products, if, during the existence of price controls by law as affecting the oil industry, the supply-and-demand situation on heavy fuel oil should materialize, it feels that imposition of controls as described on fuel oil alone, leaving crude and other product prices unrestricted, could be considered on its merits when and if that time came."

Heroy Cites Five-Point Program For Maintaining Oil Reserves

ATLANTIC CITY. — A five-point program for maintaining the nation's oil reserves was proposed by William B. Heroy, retiring official of Petroleum Administration for War at a natural-resources symposium in connection with the annual meeting of the Chamber of Commerce of the U. S. here May 2.

The meeting was opened by Gov. Robert S. Kerr of Oklahoma, who declared that the states have fully as much interest in conservation of natural resources as has the federal Government.

"In the final analysis," the governor said, "all conservation and all utilization of natural resources take place at the local level and experience has demonstrated that the best results can be obtained by and through the state and local governments. The federal Government renders its greatest service, serves its highest usefulness, and obtains its most effective results through supporting and coordinating conservation by and through the state and local governments."

He cited the Interstate Oil Compact Commission as a model for joint action in conservation of other natural resources.

Heroy pointed out that while the United States entered the war with a large excess capacity to produce crude oil we now have a substantial deficiency and are at present producing about 200,000 bbl. per day in excess of maximum efficient rates. To build up a reserve capacity, Heroy advocated that:

1. Domestic operators receive added encouragement to develop new oil resources;
2. Oil-producing states take action to prevent waste of oil and gas resources;
3. Additional potential areas, such as the Continental Shelf and Alaska, be explored and tested:
4. American interests be encouraged to develop foreign oil resources;
5. Petroleum required for our internal economy which cannot be supplied from domestic sources except by overproduction be imported from foreign countries.

In explaining widespread exploration programs under way during the war period Heroy said in part:

"On the whole the results have been disappointing. While the number of successful wildcat wells has been large, the volume of new resources found has been relatively small and very few new fields of major importance have been discovered. During the 5-year period, 1941-1945, production has exceeded new discoveries by more than 5.5 billion barrels.

"Proved reserves in older fields have been added to during this period by development drilling and the quantities of new oil thus blocked out have been large, but, when effect is given to all these factors, the net result has been that the production rate has increased much more rapidly than have crude reserves. Furthermore, the rate at which reserves are being extracted has also increased. During 1940, 7.3 per cent of the proved reserves existing at the beginning of the year were produced while, during 1945, production was at the rate of 8.5 per cent of the initial crude reserves."

Kansas Operators Protest Well-Spacing Action

WICHITA, Kans.—Members of the Kansas Independent Oil and Gas Association last week expressed dissatisfaction with the new rule of the Kansas Corporation Commission which allows 40 acres credit for wells of more than 4,000 ft. depth.

The commission the previous week set 20 acres as the basic acreage attributable to wells of less than 4,000 ft. but W. H. Bird, president of the Kansas association, said various members of the organization feel that the 20-acre basis should be provided for all Kansas wells.

The association president said the group would meet this week to consider what action to take in opposition to the new order.

Meanwhile, a request for a rehearing on the new proration rules was filed with the commission by A. W. Hershberger, attorney. Hershberger said he represented several hundred companies, individual operators, and royalty owners who believe the commission should have rescinded the wartime rule completely, leaving the prewar 20-acre plan in effect.

"We feel that it would have been simpler and more equitable if the commission had simply rescinded the 40-acre wartime rule," Bird said. He added the commission could then consider large credits for pools in cases special conditions warrant.

Bird said many Kansas operators felt that the commission had delayed in announcing the revision of the acreage credit rules. "They should have been out months ago, but we realize that the commission does have other business than oil to regulate," he said.

Krug Reveals Stand On Oil Leasing Bill

WASHINGTON. — A substitute for the bill revising the Oil Leasing Act was offered by the Interior Department this week as hearings opened before the Senate Public Lands Committee on S 1236 sponsored by Senators Hatch of New Mexico and O'Mahoney of Wyoming.

The department proposal was submitted and explained by Secretary J. A. Krug and Joel Wolfson, assistant commissioner of the General Land Office. They agreed that the 1920 act needs some revision and approved of certain provisions of the Hatch-O'Mahoney bill but vigorously opposed other features, particularly a flat 12½ per cent royalty. Krug also opposed provisions which would give a preferential royalty rate to discoverer of a new pool, deny the secretary the right to fix the value of royalty oil, and restrict competitive bidding for leases. He approved some enlargement of the areas which may be contained in a single lease but felt that the limits in the pending bill are too large to prevent monopoly control.

Krug and O'Mahoney engaged in a lengthy discussion over proper government policy regarding oil development. Krug agreed that it is highly important to encourage new discoveries and enlargement of reserves but contended the department is also charged with prevention of monopoly and promotion of conservation and that the Hatch-O'Mahoney bill does not give sufficient consideration to these points. The secretary flatly denied O'Mahoney's charge that the department considers itself the proprietor or owner of public lands and that it believes that conservation means prevention of search for new oil.

A large number of industry witnesses were prepared to testify and hearings were expected to continue most of the week.

THIS WEEK

REGULATION—President Truman signs order terminating PAW. . . . Action regarded as blow to government advocates of continued control of the industry. . . . ¶Secretary of the Interior Krug acts promptly to carry out the president's instructions. . . . Sets up oil and gas division in the Interior Department to function as a coordinating agency and for liaison with the industry. . . . Industry committee planned to assist the agency. . . . ¶Kansas operators dissatisfied with new Corporation Commission order on basic acreage. . . . Believe state should have returned completely to 20-acre plan. . . . ¶Washington hears reports committee studying amending Espionage Act may investigate reported sale of catalytic-cracking secrets to foreign governments. . . . ¶United States Chamber of Commerce in national referendum approves 12 1/2 per cent government royalty on unproved areas, free right of assignment and relinquishment of government leases, and congressional recognition of state tidelands ownership.

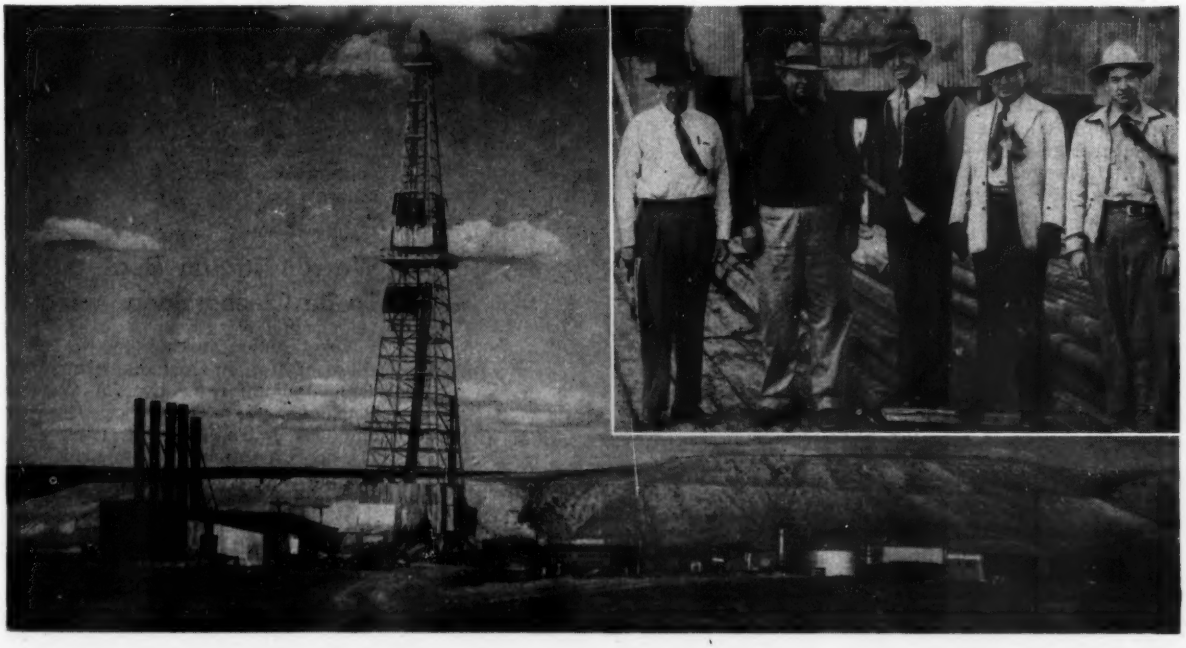
PRICES—Preliminaries to oil price decontrol move slowly. . . . Advisory committees tell OPA officials in Chicago prices will rise on decontrol but only enough to meet increased operating costs. . . . That continued delay in decontrol makes more difficult the eventual task the industry faces in meeting higher producing and processing costs. . . . ¶Sumner Pike, retiring OPA official, says coal strike may force postponement in decontrol date. . . . ¶Tank-car gasoline prices in Mid-Continent area rise 1/8 cent for the second time in 2 weeks. . . .

PERSONALITIES—Ralph K. Davies resigns from California Standard. . . . Says he has no plan for the future except an extended vacation after helping organize new oil and gas division in the Interior Department. . . . Makes it plain Ickes appearance at California Standard stockholders' meeting was without his sponsorship. . . . Davies' resignation cut short Ickes' plan to fight for his reinstatement. . . . Ickes announces he will pursue his fight "in another forum." . . .

REFINING—CPA says new order allotting 4,160 tons of lead for May will produce about 25 per cent less tetraethyl fluid than used in the first quarter. . . . Cites the disappearance of the large fluid inventory. . . . Government restricts ethyl fluid exports to conserve supply. . . . CPA invites group to Washington meeting this week to form lead advisory committee. . . . Some refineries in Chicago area face shutdown in electric power curtailment due to coal strike. . . .

STATISTICS—Bureau of Mines places May crude demand at 4,626,000 bbl. daily. . . . Says preliminary data show first-quarter motor fuel demand about 20 per cent greater than in first quarter of 1941. . . . Forecasts second-quarter motor fuel demand 11 per cent above the same period of 1941. . . . ¶Crude production last week soared to 4,747,452 bbl.—80,702 bbl. above previous week. . . . Gasoline production hits 15-week high. . . . Gasoline stocks drop under 100,000,000 bbl. for first time in 14 weeks. . . .

Considerable momentum has been added to the active inner-basin exploration campaign in the Rocky Mountain region by the Mountain Fuel Supply Co. 1 Unit, NE SW NW 8-16n-112w, located on the Church Buttes structure in Uinta County, Wyoming. This well, the deepest to date in the Rocky Mountains, is the first inner-basin discovery in the large Green River basin and the second in the entire region. It was drilled by Rocky Mountain Drilling Co. on a 50,000-acre unitized block held jointly by Mountain Fuel Supply Co. and Union Pacific Railroad Co. Shown in the inset picture are: Louie Whipple, general superintendent for Rocky Mountain Drilling Co.; C. J. Gibson, superintendent of Church Buttes operation for Rocky Mountain, and three officials of Mountain Fuel Supply Co.: D. K. Bowen, superintendent of production; W. T. Nightingale, vice president and general manager, and Jack Simon, petroleum engineer



Gas Industry Urged to Resist Further Federal Regulation

by Warren W. Burns

CINCINNATI. — Coordinated planning and action to prevent the imposition of further governmental restrictions and regulations, and cooperative aggressive pursuit of research to find more economical and utilitarian methods of producing, transmissing, and utilizing gas were put up to the Natural Gas Department of American Gas Association at its forty-first annual meeting here May 7 and 8 as being the two most pressing needs now facing the gas industry.

Warnings of the threat of continued encroachment of federal direction into the affairs of the industry were specifically issued by E. J. Boothby, president of A.G.A. and vice president and general manager of Washington Gas Light Co., Washington, at the opening session. Boothby branded the current Federal Power Commission as being "a means to an end and an indicator of other aggravations to come." He blamed politicians and bureaucrats for the policies now being followed in apparant federal aggression.

The A.G.A. is the medium through which unity of the gas industry can and should be attained in opposing the threat of further governmental interference and in pursuing research to increase the utilization of gas, Boothby declared.

The growing importance of natural gas was proclaimed by R. H. Hargrove, chairman of the Natural Gas Department of the association and vice president and general manager of United Gas Pipe Line Co., Shreveport, in his opening remarks.

"Natural gas is the fuel of the future," Hargrove said.

Commenting on the growth of the natural-gas industry within the past decade, he pointed out that this industry now serves 41,000,000 people in 33 states with a network of 218,000 miles of trunk pipe lines and mains, and has a total production of 3½ trillion cubic feet of gas with a market value of $750,000,000. It has advanced, he continued, from 38 to 48 per cent in the number of customers served by the whole gas industry, and has total assets of more than $3,000,000,000.

E. Holley Poe, speaking of FPC's interpretation of the Natural Gas Act, emphasized the need of "ordinary honesty and frankness on the part of those who promulgate the laws," and said "there is just as much need for reasonable limits of power of FPC as there is need of regulating the interstate phase of the natural-gas industry operations."

Intention of Commerce Clause

The commerce clause in the Natural Gas Act is only intended to be a guarantee of free trade and competition between the citizens of various states, and if the letter and the spirit of the act needs further spelling out it should be amended by Congress and not by FPC, he emphasized.

Neither the word nor the spirit of the act "indicates any intention or necessity for uncontemplated regulatory excursions, interventions by competitors and their related groups for selfish business reasons, or of the consideration of any ideology or sociological theories. Intervention by interested parties that are being discriminated against is as American as the Bill of Rights. But, intervention for the sole purpose of obstruction or progress in our national economy is as reprehensible as any other attempt to arrest freedom of enterprise or to restrain the public advantage of buying and utilizing any legitimate commodity that is produced and enters the stream of interstate commerce."

Commenting on the coal strike, Poe said that if coal consumers who are anxious about 28 million tons of unmined coal had used but 1½ trillion cubic feet of natural gas they would have had a higher degree of efficiency than with coal-fired operations.

R. H. Hargrove, chairman, natural gas department, A.G.A.

Presenting a progress report of the Natural Gas Reserves Committee, Lyon F. Terry, vice chairman of the committee and second vice president of Chase National Bank, stated that if natural-gas reserves of the United States were measured in terms of heat units, they would be as large and probably greater than known reserves of petroleum. He said that the first nationwide estimate of gas reserves being compiled by the committee probably would be completed by summer.

Installation and maintenance of liquid petroleum gas plants by natural-gas-transmission and distributing companies to provide augmented or auxiliary and standby fuel for emergencies was discussed by Francis E. Drake, Pacific Gas Corp., New York City, in his paper on "Utilization of L. P. Gas by Natural-Gas Companies," He said the use of L. P. gas is particularly advantageous in "shaving peaks" during periods of heavy loads on pipe lines and in maintaining service to consumers during line breaks or cutoffs.

"L. P. gas can be substituted for natural gas without a burner or shutter change by the simple expedient of adding a few extra B.t.u.'s," he pointed out, "and installations can be arranged that without human hand they automatically and positively come into service instantly when a predetermined low point in pressure is reached in the transmission or distributing system."

Cost of installation and operation of L. P. gas auxiliary plants is small, and, in view of the economical benefits to be gained in effecting more uniform flow of natural gas through lines and maintaining service during emergencies, are more than justified, he said.

Drake advocated the adoption of the B.t.u. value of a gas instead of volume as a basis for gas rates and billing.

Warren-Hanlon Deal To Be Closed Soon

Negotiations looking to the purchase of Hanlon-Buchanan, Inc., and associated interests by the Warren Petroleum Co., Tulsa (see The Oil and Gas Journal, May 4, 1946, page 71), are progressing satisfactorily, according to reports this week. It is expected that final arrangements for the cash purchase of the Hanlon properties will be completed within the next 2 weeks.

Among the leading figures at the midyear directors' meeting of the Independent Petroleum Association of America last week in Houston were: Glenn H. McCarthy, Houston; H. B. Fell, Ardmore, Okla., executive vice president of the association; Russell B. Brown, Washington, general counsel for the association; Ralph A. Johnson, Houston, Southeast Texas vice president of the association; and B. A. Hardey, Shreveport, association president

Independents Demand OPA Make Good Its Promise on Oil

HOUSTON.—The mid-year meeting of the directors of the Independent Petroleum Association of America came to a close here last week on a continuing theme of vigorous opposition to Office of Price Administration oil control.

The 450 or more oil men gathered here for the meeting, including many members of the newly organized Texas Independent Producers and Royalty Owners Association, heard the OPA attacked time and again in talks by B. A. Hardey, I.P.A.A. president; Walter S. Hallanan, president of Plymouth Oil Co.; Glenn H. McCarthy, head of the Texas independent producers committee; and H. J. Porter, president of the Texas producers and royalty owners organization. The annual I.P.A.A. meeting was set for October 28-30 in Fort Worth.

In a formal resolution adopted at the closing session, the I.P.A.A. called on OPA to make good its promises and remove price controls from petroleum and its products. Copies of the resolution were directed to Congress which was urged to assure decontrol by legislative action.

In another resolution, the association asked that all government agencies recognize the needs of the industry for an adequate supply of tetraethyl lead. The effects of the lead shortage on independent producers were described earlier by H. B. Berg, representing the Ethyl Corp.

Plans for the formation of an oil industry advisory committee similar to the disbanded Petroleum Industry War Council also came to the attention of the I.P.A.A. directors. A committee was named by Hardey to confer with the executive committee of the Interstate Oil Compact Commission at its next regular meeting in August on plans for the organization of such an industry group. Members of the I.P.A.A. committee are Charles F. Roeser, Fort Worth; Frank Buttram, Oklahoma City; Wirt Franklin, Admore; and Ralph T. Zook, Bradford, Pa. Hardey said a peacetime petroleum council that could confer with all segments of the industry is particularly vital at this time.

Another highlight of the closing sessions of the meeting was a 5-year forecast of crude demand presented by Minor S. Jameson, Jr., staff statistician for the association.

Jameson estimated daily average demand for 1946 as 5,150,000 bbl., including 320,000 bbl. daily of natural gasoline and benzol. Demand, he predicted, will progressively increase to a total of 5,750,000 bbl. daily in 1950, including natural gasoline and benzol of 360,000 bbl. daily.

Imports were figured on a basis of 4.5 per cent of the 1933-39 ratio to demand. These were placed by the statistician at 230,000 bbl. daily in 1946 and increasing to 10,000 bbl. daily a year to 260,000 bbl. daily in 1950.

Recent statements attributed to officials of Standard Oil Co. (N. J.) and of Petroleum Administration for War implying that it is impractical to meet both gasoline and fuel oil demands over a long period from domestic crude production were criticized as unsound by Jameson. "I believe we should exert every effort to deny them lest they become accepted and embodied industrial and governmental policies that may lead to the stifling of the independent in the industry," he declared.

Proposals that domestic crude generally should be used to meet gasoline and light products demands, leaving the remaining residual market to be filled from imports, also was opposed by Jameson. He said the theory was misleading and a contradiction in that it would meet large demands for residual and still consider it a waste product to be sold at a loss.

At a luncheon meeting, Hallanan declared that there is "no room in a free America for government control that is exercised for control's sake alone."

"There must be some justification in the public interest. That justification does not exist today so far as the oil industry is concerned," he asserted.

Hardey, in his report to the group, said he was "optimistic" over the removal of controls from the industry. He also took a favorable view of the efforts to obtain a national oil policy that would control over imports.

Discussing the recent request of the Navy for more Texas crude, McCarthy said the producers had sought to have OPA send a representative to the state allowable hearing in April. Refusal of the agency to appear, he declared, was because "they had no answers for the questions raised."

Boyd Given Highest Civilian Decoration

WASHINGTON.—The Distinguished Service Medal for Merit, highest civilian decoration of the Government, has been awarded by President Truman to William R. Boyd, Jr., for his activities as chairman of Petroleum Industry War Council.

The presentation was made to Boyd this week by Secretary of the Interior J. A. Krug. Boyd is president of American Petroleum Institute.

International

WORLD-WIDE OIL DEVELOPMENTS

Jersey Standard Seeking New Italian Concession

ROME.—A request to expand its prewar oil exploration activities in Italy has been filed with the Italian Government by Standard Oil Co. (N. J.)

The company's petition seeks permission to exploit larger tracts than 4,942 acres which was the limit under the old prewar concession policy. New Jersey Standard spent more nearly $5,000,000 in geological work in Italy under a 1926 concession. At that time, the limit on the area was considered too small for large-scale exploration. After the war started, the company's activities were continued to some extent under Italian Government supervision.

Other companies also are reported interested in obtaining oil prospecting concessions in Italy. Some geologists think further search of the country with better equipment and methods may result in the discovery of substantial deposits.

Though Italy began producing in 1860 and was the second producing country after the United States, its total production through 1945 has been only 3,500,000 bbl. About 90 per cent of the present production of about 100,000 bbl. annually comes from the Emilia region in northern Italy. Slight surface indications of oil, asphalt and natural gas have been found elsewhere in the country.

Chilean Refinery Planned to Process 10,000 Bbl. Daily

NEW YORK.—Plans for a 10,000-bbl. a day refinery to be built in 1947, near Valparaiso, Chile, are nearing completion, according to a representative of Corporacion de Fomento de la Produccion. The refinery probably will include a thermal cracking unit.

While it is still uncertain whether the bulk of the refinery's crude will come from Chile's Spring Hill field, where a discovery well was brought in last December 29, or from Peru and other world markets (possibly even the Middle East), it is certain, the representative explained, that the refinery will be built. In fact, plans for this refinery were made even before it was determined whether Chile would have any of its own production.

With the certainty of crude oil in Chile, a second well was started in February, with its completion expected sometime late in April or early May. Surface pipe for this well reportedly is at hand. The discovery well is believed to be capable of flowing up to 8,000 bbl. daily of 39° A.P.I. crude, but at present is shut in, due to lack of adequate transportation and storage facilities.

Geological work here was conducted by United Engineering Corp., under direction of Glenn M. Ruby, and the geophysical work was performed by United Geophysical. The George P. Livermore Corp., of Texas, is drilling contractor. The contract calls for the drilling of at least three wells.

Chile's Consumption

Chile's total consumption is approximately 16,000 bbl. daily, with 3,500 bbl. gasoline, 5,000 bbl. kerosene and the remainder mostly fuel oil. The industries in northern Chile are large fuel-oil consumers. While the projected refinery will produce about 10,000 bbl. of finished products daily, this still leaves about 6,000 bbl. daily of refined products to be imported.

Fomento's total investments to date, for geological and geophysical studies, in addition to equipment and supplies, are in the neighborhood of $2,000,000, and the complete expenditure for Chile's oil program is now between $30,000,000 and $40,000,000. The increased appropriation is largely due to the discovery of oil at the Spring Hill field, about 6 miles from Puerto Progreso, Tierra del Fuego, Straits of Magellan.

According to Chilean law, only the government may explore and exploit Chile's oil. In fact, long before it was thought that this country might have indigenous crude, the law provided that only the government, through properly designated national agencies (such as Corporacion de Fomento de la Produccion) could engage in oil activities. However, in the case of other industries, Fomento—organized to develop industries in Chile—follows a different pattern.

New Drilling in Germany Brings Production Gain

WASHINGTON.—A drilling program undertaken in the British zone of occupied Germany has reversed a downward trend in production from the country's fields and brought a 1.4 per cent rise in output in January.

Total German production in January was 54,122 metric tons (378,475 bbl.) a rise of 760 tons (5,314 bbl.) over the preceding month. The overall net increase is accounted for wholly by a gain of 2,929 tons (20,482 bbl.) in production from the Hanover area.

According to reports reaching here, all other producing areas showed declines in January. The increase in the Hanover area appears to have resulted from the drilling program which includes sinking of about 60 wells at existing fields and the tapping of 19 previously untested salt domes by wildcats.

Over-all oil stocks in Germany remained unchanged, though refinery output and shipments of refinery products dropped. Liquid fuel requirements in the American zone continued to be met chiefly from U. S. Army stocks which supplied 71 per cent of January's total against 65 per cent in December.

Netherlands Concession Given Royal Dutch Co.

THE HAGUE, The Netherlands.—New oil concessions in the Dutch province of Drenthe have been granted by the Dutch Government to Batavian Oil Co., a subsidiary of Royal Dutch Co.

The company was authorized to exploit newly discovered fields in the province near the German frontier where the first Dutch wells were discovered in 1937. The concessions also cover three other areas in the province. Production was halted during the war, but it is reported that trial drilling is now being carried out near the Dutch frontier town of Oldenzaal. Royal Dutch requested British military authorities for concessions on German oil areas across the border.

Dallas Independent Aids In Colombian Refinery

BOGOTA, Colombia.—One of the principals in the Colombian Government's proposed royalty oil refining project is reported to be D. D. Feldman, independent operator from Dallas, Tex.

Feldman has been in Colombia recently making a survey of the country's oil developments. According to information here, the proposed refinery would require about 31 per cent of the crude available as royalty. With a current oil production of 2,000,000 bbl. monthly, the royalty oil available to the government is about 200,000 bbl. monthly.

Colombia Studying Plan To Refine Royalty Oil

BOGOTA. — The Colombian Government and the oil advisory board are reported to be studying a project to build a national refinery which will process the government's royalty oil.

Disclosure of the plan was made here in the publication La Razon. It said the plant is planned as "one of the largest projects of its kind in America." Full details on the plan were not given.

New Guinea Exploration

As soon as political conditions are settled in the Netherlands East Indies and sufficient exploratory equipment available, Nederlandsche Niew Guinee Petroleum Maatschappij (New Guinea Petroleum Co.), which did some exploratory work there before the war, will resume operations.

This company is 40 per cent owned by Bataafsche Petroleum Maatschappij (Batavia Petroleum Co. - Shell Group); 40 per cent by Nederlandsche Koloniale Petroleum Maatschappij (Colonial Petroleum Co.-Standard-Vacuum Oil Co.); and 20 per cent by Nederlandsche Pacific Petroleum Maatschappij (Standard Oil Co. of California).

The company has an initial prospecting area of 24,710,000 acres, to be reduced to 2,417,000 acres over a 10-year exploratory period, and is capitalized at 1,000,000 florins, about $500,000.

Gas Reforming Plant to Be Constructed at Toulouse

NEW YORK.—A contract has been awarded by the Office National de l'Azote of France to the Chemical Construction Corp. to construct and equip a gas reforming plant at Toulouse for the conversion of natural gas into hydrogen and nitrogen for use in the synthesis of ammonia, it has been announced here.

The corporation, which is a subsidiary of American Cyanamid Co., engages in the design and construction of plants for the chemical industry.

Trinidad Leaseholds Production Declines

NEW YORK. — Oil production by Trinidad Leaseholds (N. Y.), Inc., from its own fields in February and March continued to show a decline from previous months.

Daily average production in February was 16,164 bbl., and in March, 16,016 bbl. Daily average in January was 17,237 bbl. Total production for February was reported at 452,595 bbl., and for March, 496,841 bbl.

British Name Directors

LONDON. — Field Marshall Viscount Alanbrooke and Sir Percival Robinson have been named by the British Treasury to succeed Sir Edward Packe and Sir George Barstow as ex officio directors of the board of Anglo-Iranian Oil Co.

Caltex Oil (Aden) Formed

NEW YORK.—Caltex Oil (Aden) Ltd., has been organized as a subsidiary of California Texas Oil Co., Ltd., to market products of Bahrein Petroleum Co., Ltd., in the Aden area. Bahrein Petroleum is owned jointly by Standard Oil Co. of California and The Texas Co.

International

Preliminary Data Shows 1945 Cuban Oil Imports

WASHINGTON. — Cuba imported 1,036,726 metric tons of fuel oil during 1945, of which the United States supplied 131,483 metric tons, according to the Foreign Commerce Weekly of the Bureau of Foreign and Domestic Commerce.

The Government publication said preliminary figures show other imports as 81,590 metric tons (about 605,000 bbl.) of crude and 56,375 metric tons of gasoline, and 1,225 metric tons of paraffin. The United States supplied all the other items except 5 metric tons of paraffin.

Cooperatives Buy U. S. Oil

KANSAS CITY.—Cooperative organizations in Sweden, France, South Africa, and the Netherlands are ordering lubricating oil from the Coffeyville, Kans., refinery of Consumers Cooperative Association, according to a report in a recent cooperative publication.

Colon Production Down

CARACAS. — Colon Development Co.'s Venezuelan production for the 4 weeks ending April 1, was 504,605 bbl., compared with 513,650 bbl. for the 4 weeks ending March 4. Colon Development is a Shell operated company.

These employes of the Ras Tanura refinery of Arabian American Oil Co. have accumulated a total of 244 years' experience with the company and its parent companies. They were recently awarded service pins for 10, 15, 20, and 25 years' service. The men, and the year they joined the company are, standing: Franklyn Rea, 1929; R. A. Witherow, 1923; W. F. Guion, 1925; L. Y. Saulmon, 1920; F. W. Russell, 1930; James Clemenis, 1925. Kneeling: G. W. Hastings, 1925; H. L. Thompson, Jr., 1933; F. W. Tracy, 1927; Edward Field, 1925; G. H. Orr, 1925; C. T. Butler, 1925

International

Flow of N.E.I. Oil Awaits Only Settlement Of Postwar Political Problems

THE oil fields of the Netherlands East Indies supply an important amount of the total oil production outside the United States. By the end of 1940 these fields had produced more than a billion barrels of oil. Very little is known of the development and production during the Japanese occupation, but the geology of the region indicates that many large fields may yet be discovered in the East Indies.

The first successful oil wells in the entire Archipelago were drilled in 1885 in north Sumatra, followed by a shallow discovery in 1888 in east Java in the neighborhood of Soerbaja. A few years later oil was discovered in south Sumatra (Palembang) by small oil companies. All discoveries were in the upper Miocene and Pliocene, and these were the only formations from which oil was obtained until 1922.

In 1922 commercial oil was found in south Sumatra in the Aquitanian (upper Oligocene or lower Miocene), and since that time it is estimated that the Aquitanian has produced 168,000,000 bbl. of oil, or about 17 per cent of the total East Indies production. In 1939 oil was found in the Eocene in south Borneo but it has not yet been developed commercially. Annual production in the East Indies amounted to 39,000,000 bbl. in 1930, and increased steadily until it reached 60,000,000 bbl. in 1940.

The production of oil from the several districts in the East Indies is shown in Table 1.

Active Companies

The first company to operate in the East Indies took over concessions in north Sumatra in 1890. This company was amalgamated with Shell Transport and Trading Co. in 1907, which formed the Royal Dutch-Shell Group, with the Bataafche Petroleum Maatschappij (B.P.M.) as the operating company in the East Indies. B.P.M. took over the oil fields in north Sumatra as well as those in eastern Borneo. Other fields were taken over in Java, and B.P.M. was thus operating in all the major oil basins of the Archipelago.

For the development of the prolific fields of Djambi (south Sumatra) the Netherlands Indies Government became a partner of B.P.M. and established a subsidiary called the Nederlandsch Indische Aardolie Maatschappij (N.I.A.M.). This company also holds some small concessions in north Sumatra and eastern Borneo.

THE oil of the Netherlands East Indies will begin to come back into the world markets within a short time after the postwar political problems are settled. Representatives of the oil companies are waiting in their various East Indies' headquarters for the time when they can get in to rehabilitate their properties.

This article, the first of a series of two, gives the highlights of the exploration and production history of these fields up to the time of the Japanese invasion. It is derived largely from two articles in the A.A.P.G. Bulletin, "Principal Sedimentary Basins in the East Indies," by E. W. Beltz, October 1944, and "Geology of Oil Basins of East Indian Archipelago" by H. M. Schuppli, January 1946. Text was prepared by Herndon David, of the Journal editorial staff.

In 1912, American interests started oil operations in the Archipelago. The Nederlandsche Koloniale Petroleum Maatschappij, or N.K.P.M., was originally a 100 per cent owned subsidiary of the Standard Oil Co. of New Jersey, but later Socony-Vacuum Oil Corp., Inc., acquired a 50 per cent interest, and it is now a subsidiary of Standard-Vacuum Oil Co., which is owned 50-50 by these two companies.

N.K.P.M. obtained its first production in east Java, and later rich oil accumulations were discovered in the Talangakar-Pendopo area of south Sumatra.

In 1931, the Nederlandsche Pacific Petroleum Maatschappij, N.P.P.M., entered the picture. This company, a subsidiary of Standard Oil Co. of California and The Texas Co. (Cal-Tex), was carrying out extensive exploration work in the coastal plains of middle Sumatra at the time of the Japanese invasion. Oil in commercial quantities was discovered on two structures, but prewar developments had not reached the stage of commercial production.

The last prewar development was the creation of the Nederlandsche Nieuw Guinea Petroleum Maatschappij, N.N.G.P.M., in 1934, in which Royal Dutch-Shell and Standard-Vacuum each owned 40 per cent and the Cal Tex 20 per cent. This company received a concession of 25,000,000 acres in the Netherlands part of New Guinea, and at the time of the occupation had discovered commercial accumulations of oil on several structures in the Vogelkop area.

General Geology

An over-all picture of the potential oil resources of the East Indies involves an evaluation of five large islands and nearly two score smaller ones, totaling 735,000 square miles, an area twice as large as Texas, spread over a region larger than the United States. The topographic and geologic conditions are as varied as those of the United States but the interpretation of the general geologic conditions is more difficult because of the large gaps in areal geology between the islands.

TABLE 1—EAST INDIES CRUDE AND CASING-HEAD GASOLINE

	Year production began	Production in bbl. 1940	Production in bbl. Cum. 1-1-41	No. prod. wells 1-1-40
Sumatra:				
North	1893	7,566,707	142,779,224	170
South (Djambi)	1923	9,610,560	54,661,783	
South (Palembang)	1898	23,335,596	281,668,685	1,350
Total Sumatra	....	40,512,863	479,049,692	1,520
Java	1886	6,090,203	106,002,410	330
Borneo:				
N. E. (Tarakan)	1906	5,397,691	143,725,407	
S. E. (Balikpapan)	1898	6,926,649	238,637,178	880
West (British Borneo)	1913	7,154,060	101,168,000	
Total Borneo	....	19,478,340	483,530,585	
Ceram	1913	665,912	7,474,371	55
Total East Indies	....	66,747,318	1,078,057,056	2,785

The problem, however, is somewhat simplified because the oil possibilities of the East Indies appear to lie almost entirely in sediments of Tertiary age. A number of islands, especially those along the island arc, are largely geanticlines, and are flanked by greater or smaller portions of adjacent Tertiary geosynclines. These geosynclines reached their greatest extent in the late Oligocene and lower Miocene when marine sediments were almost universally deposited.

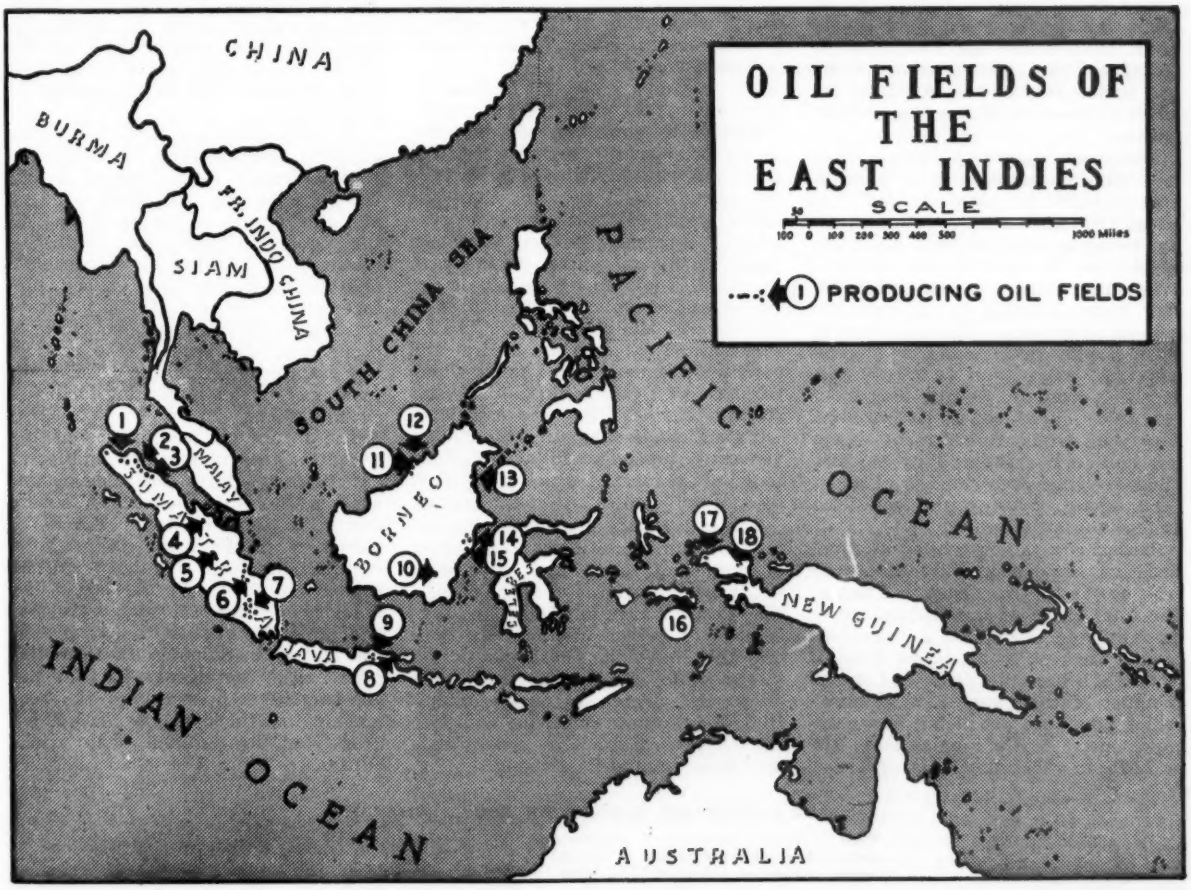
Commercial oil accumulations in the East Indian basins are restricted to sands of upper Miocene and Pliocene age except in one field in south Sumatra and the Barito basin in southeastern Borneo. In south Sumatra on top of pre-Tertiary highs in some anticlinal cores the lower Miocene shale section is greatly reduced in thickness and contains sand intercalations, some of which are highly productive. Shortly before the war commercial oil accumulations were found in beds of Eocene age in the Barito basin.

Most of the attractive and more accessible structures in the Miocene and Pliocene had been tested at the time of the invasion, except in New Guinea, and remaining structural prospects lie in complicated structures; structures with small or doubtful closure; structures situated in remote areas; or structures concealed by alluvium or by unconformable horizontal strata. In addition to structural prospects, stratigraphic traps are present but they have only recently received attention in a few areas, in Sumatra and Borneo.

The whole region is relatively unexplored, the amount of wildcat drilling, even in the best explored basin, south Sumatra, being on the order of one well to 75-100 sq. mi., as compared to one well per 1.8-10 sq. mi. in the several basins in the United States. Practically all the oil produced is from relatively shallow depths. There is little doubt, therefore, that more extensive testing will yield many deep discoveries in already productive areas as well as important new discoveries in undeveloped areas.

Sumatra

The producing structures of Suma-



1.—Poele	4.—Djambi	7.—Tandjoeng	10.—Bandjermasin	14.—Mathilde Fields
Penowa	Tempino	Limau	11.—Mateding	15.—Louise
Pase	Kenaliassam	Soebandjerigi	Miri	Moera
2.—Prahoehila	Boenjoe	8.—Soerbaja Fields	Seria	Sambodja
Perlak	5.—Badjoebang	9.—Semarang	12.—Brunei	16.—Boela
Tamiang	6.—Kloeang	Rembang	Labuan	17.—Vogelkop Fields
3.—Rantau	Banakat	Kawengan	13.—Mandoei	18.—Babo
Soesoe	Pendopo	Tjepoe	Tarakan	
Pangkalan		Kopoean	Sanga	

Fig. 1—Fields indicated by arrows are listed in accompanying box

tra are located within a geosyncline which is hinged on the Malay Peninsula on one side and is bounded on the other by the Barisan Mountains. Only a narrow part of the geosyncline is present in north Sumatra, the greater part having been covered by the sea in late Pleistocene times. In central and south Sumatra, however, the greater part of this geosyncline is present.

North Sumatra

The producing structures of this oil basin are located in a narrow strip between the coast and the steeply folded foothills of the Barisan Mountains, the northeastern part of the basin lying under the waters of the Malayan Strait. About a dozen fields had produced close to 150,000,000 bbl. of oil at the time of the Japanese invasion.

The most important field is Rantau, with an average daily production of 15,000 bbl. during 1940. The oil of this field is of excellent quality, being a light oil with a gravity of 44.4° to 51.2° A.P.I. The yield of aviation gasoline is as high as 21 per cent, motor gasoline 44 per cent, and fuel oil 30 per cent. Production started at Rantau in 1929 and by December 1936, more than 24,000,000 bbl. had been produced. During 1940 about 140 wells produced 5,707,000 bbl. Nearly all wells were flowing, but a few had to be produced by gas lift. The developed area consists of about 1,000 acres, covering the southeast half of the structure.

Rantau is a rather gentle anticlinal structure divided into a number of fault blocks by two systems of faults. The total effect of the faulting gives the anticlinal structure a "caved-in crest." The oil is produced from a section of alternating sands and shales of upper Miocene age. A large number of sands are producing, the most important at depths ranging from 925 to 2,675 ft. The thickness of these sands varies from 10 to 100 ft., and great variations of texture, porosity, and permeability occur.

The structure has been tested to a depth of about 5,600 ft., but below the producing sands a predominantly shaly section was encountered. All producing zones, especially the shallow ones, have a more or less extensive gas cap. The volume of the gas cap and the subsea depth of the gas-oil and oil-water contacts show considerable variation for the different fault blocks. Water drive as well as depletion plays a part in the production processes.

Structure maps of different formations indicate a gradual slight steepening of the structure with depth, caused by slight thickening of individual beds off structure. On the other hand, it appears that the throw of individual faults does not increase with depth, and in some places it can be observed that faults entirely disappear downward.

South Sumatra

The oil-bearing area of south Sumatra belongs to a separate Tertiary basin differing in many respects from the north Sumatra basin. Here the entire width of the Sumatra geosyncline is present. The southwestern limit of this oil basin, as in north Sumatra, is formed by the highly upfolded and complicated structures of the Barisan Mountain range. The oil fields are situated in the central and southwestern part of this basin, which consists of low rolling hills and swampy plains. They are associated with anticlinal structures which are generally arranged in well-defined anticlinoria, most of which are broken by normal faults into fault blocks.

Table 2 shows production figures for the main fields of the area, depths of producing sands, and some data about the characteristics of the crudes. These crudes vary in quality and percentage of higher fractions. In general they have the characteristics of intermediate-base crudes and have a varying degree of wax content. Djambi crudes are relatively wax free and have more aromatic constituents than those around Palembang.

The producing sands of the south Sumatra basin are upper and lower Miocene in age, belonging to the middle and lower Palembang formation and the Telissa formation. Part of the Telissa oil is obtained from basal Miocene sands and granite wash. Most of the fields are producing from a number of sands and some from as many as twenty. Water-drive as well as depletion-type fields occur.

General Geology

Intensive folding is common along the foothills of the Barisan Mountain range while along the Malayan foreland the folds are gentler and in some areas there is little or no folding. Practically all of the exposed moderately to gently folded closed anticlinal structures have been tested, particularly in south and central Sumatra. In north Sumatra very steep, high structures along the mountains outnumber the gentler folds of the coastal region, but few of these have been tested because of the erosion of oil sands.

Oil indications are numerous in the Miocene and Pliocene in north and south Sumatra, but in central Sumatra there is only one slight oil seep and this occurs at the very base of the section. In central and south Sumatra there is evidence of considerable relief in the pre-Tertiary surface on which the Tertiary strata were deposited, and since source beds occur near the base of the section, topographic relief in the basal complex may be an important factor in accumulation.

The future oil possibilities of the Sumatra geosyncline lie chiefly in anticlinal structures concealed by unconformable Plio-Pleistocene strata, and in stratigraphic traps. Since the section is in the main conformable, stratigraphic traps probably will be related chiefly to the overlap of the Tertiary on the Malayan foreland, and probably will be limited to central and south Sumatra. In north Sumatra only the deeper part of the geosyncline is present and the section is too thick to be drilled for deep-lying stratigraphic trap possibilities.

TABLE 2—CRUDE-OIL PRODUCTION, SOUTH SUMATRA

Company and field—	Year prod. began	Approx. total production in bbl. (End of period indicated)	Production during 1940	Type of oil	Depth of prod. sands	Map location
N.K.P.M.:						
Benekat-Selo	1933	30,000,000 (1941)	3,707,000	Paraffinic	1,400-1,600	7
Talangakar-Pendopo	1918	99,500,000 (1941)	9,031,000	37° A.P.I. Very paraffinic	2,000-3,000	6
Djirak	1930	17,600,000 (1941)	2,528,000	Paraffinic	750-2,900	7
N.I.A.M.:						
Djambi (4 fields)	1923-35	54,601,783 (1940)	9,617,000	Light Paraffinic, 47°-48° A.P.I. in one field shallow heavy asphaltic oil of 22.5° A.P.I.	1,000-4,000	4
B.P.M.:						
Kloeang	1914	26,600,000 (1940)	742,000	Light paraffinic	500-2,600	6
Limau	1928	4,800,000 (1940)	243,000	Heavy paraffinic	5,400	6
Mangoendjaja		5,000,000 (1940)	1,580,000	Asphaltic, 23.6°-27.7° A.P.I.	430-2,000	7
Soebandjerigi area (6 fields)	1899	65,000,000 (1940)	785,000	Light paraffinic	650-2,600	7
Talangdjimar	1937	8,300,000 (1940)	3,500,000	27.6° A.P.I. Heavy paraffinic	4,300	6
Other fields	1888 and later	25,000,000+	1,203,000	.....	.....	..

WASHINGTON WATCHING

BY HENRY D. RALPH

PAW Demise

WASHINGTON.—The order terminating Petroleum Administration for War is complete and unequivocal, leaving no remnants of that wartime agency hanging over the heads of the oil industry, but came only after quite a battle behind the scenes.

A draft of a simple executive order ending PAW was prepared for the president's signature weeks ago, but it went the usual rounds of referral to the Budget Bureau, Office of War Mobilization and Reconversion, and other agencies. Many officials argued that PAW's wartime powers should be retained in some fashion just in case there should be emergency need for them, and that PAW's group of experts be kept handy to advise other government agencies. A considerable body of officials is constitutionally opposed to relinquishing any of the Government's emergency powers even though there may not be any emergency.

This battle continued up to and past the April 30 deadline for liquidation which had been set by Deputy Petroleum Administrator Davies. On May 2 President Truman told his press conference that PAW would be continued for a little while, but late on May 3 the White house issued the order terminating PAW May 8.

Thus the advocates of continued control lost their fight, but as a matter of fact there was nothing left of PAW to continue. All outstanding orders had long since been rescinded, the advisory and functioning committees had been dissolved, the staff of experts had all gone to other jobs, and Davies himself had served notice that he would not stay on. Davies had promised the industry that PAW would be liquidated and he was not going to welch on this promise.

Petroleum Integration

CENTRALIZATION of the petroleum activities of the Interior Department will give Secretary Krug a practical lesson in federal administration. In the short while he has been in the job he has already decided that some reorganization is needed all up and down the line to make the department function as a unit instead of just a collection of self-contained cells.

Even before the president gave him the petroleum integration assignment, Krug was looking around for a guinea pig to practice on. He has already made a start with activities in the Missouri Valley. Although he cut his administration teeth with the Tennessee Valley Authority, he is not advocating the "Authority" system of operating the Government. Instead, he feels that the same end can be achieved by coordinating the activities of the many federal agencies concerned with related problems. So he is having his Bureau of Reclamation and other branches of Interior pool their ideas and projects for improving the Missouri basin, and then will try to get other departments to dovetail the programs for which they have responsibility. Alaskan affairs offer another likely field for administration coordination experimentation.

Now Krug has a White House directive to do something about oil. His guinea pig won't be the oil industry but government activities affecting the oil industry. If he makes a success of this it may well serve as a model for general reorganization of the Government.

New Federal Agency

THE new agency which Secretary Krug is directed to create to "assure coordination in peacetime of the federal Government's many interests in petroleum" will be something quite different from PAW.

The president's letter says not a word about any new federal powers nor continuation of wartime controls, so the inference is strong that both he and Secretary Krug agree with Davies' conception of the new agency as simply a centralization and coordination of existing authority, that is, the prewar and continuing responsibilities which Congress from time to time has delegated to various departments, bureaus, and commissions.

Within his own department, Krug will have a relatively easy task of carrying out the president's instructions. He can't by himself, merge or abolish bureaus created by statute, but he can control their funds and their activities and can compel them to coordinate their programs and report through an intradepartmental committee or some such administrative device. The principal branches of the Interior Department concerned with the oil and gas industry are the Bureau of Mines, Geological Survey, General Land Office, Petroleum Conservation Division, Office of Indian Affairs, and Division of Territories.

But the president's instructions go farther than this, and contemplate coordination, if not physical amalgamation, of the oil and gas interests of other federal agencies. This is where the real resistance will come, because a bureaucrat is always jealous of his authority, can always put up an argument why his agency should be top dog in any reshuffling, and usually has plenty of friends in Congress and other influential quarters.

Under the reorganization act President Truman has power, within certain limitations, to consolidate federal agencies and to reshuffle their powers, and his letter indicates that Krug is to draw up reorganization plans as they affect petroleum. But former presidents have had similar desires and powers, only to discover that the resistance to change made it almost impossible to do very much reorganizing.

President Truman probably was overoptimistic when he told Krug he was sure he would find the Secretaries of State, War, Navy, and Commerce "ready to cooperate fully." There is nothing to indicate that the Navy is ready to surrender control of its Naval petroleum reserves, for example, or that State and Commerce will readily give up their respective (and overlapping) activities in promoting and reporting foreign trade if such should be recommended by Krug.

An even more difficult situation will be faced when it comes to doing anything about an independent agency, such as the natural-gas activities of Federal Power Commission. FPC is not under any cabinet officer, is responsible directly to Congress under the constitutional authority of Congress to regulate interstate commerce, and has a specific regulatory statute which, it can argue, requires it to do certain things in its way. A parallel is Interstate Commerce Commission which in its long history has never heeded—if indeed it has ever received—any suggestion from the White House as to how it should regulate railroad rates.

In the absence of additional legislation, about all Krug can hope to accomplish is a centralized interdepartmental committee which will advise the various agencies, coordinate their policies to some degree, eliminate duplication of effort, and act as a common liaison and contact office.

WATCHING WASHINGTON

The Bright Side

THE oil industry may not be entirely pleased with President Truman's plan to centralize oil matters, and particularly his suggestion that Krug establish an industry organization to consult and advise with him.

Centralization of authority, even without the addition of new powers, could develop into more effective control, harder to cope with than when diverse agencies are going their own independent and often ineffectual ways. However, the bright side is that this is a step in meeting the industry's long-standing complaint that government agencies often work at cross purposes and that there is nobody to which the industry can complain.

There could also be some misgivings about a "liaison agency of the federal Government in its relations with appropriate state bodies concerned with oil and gas." Liaison is fine in itself, but conceivably some federal official may interpret it to mean dictation. However, the Interstate Oil Compact Commission and state officials generally doubtless can be depended upon to continue to guard against any federal encroachment on their prerogatives.

Formation of an over-all industry group to work with the federal Government was tried unsuccessfully by Petroleum Industry War Council shortly before its demise last winter. Failure was due chiefly to the industry's fear that this might lead to further federal control or to unwitting violations of the antitrust act. Furthermore, the Krug committee may not be exactly what the industry had in mind in the PIWC proposal.

Industry executives can hardly refuse an invitation from the Secretary of the Interior to serve on an advisory committee. Several other cabinet members have had general or special industry advisory committees with varying success. And the oil industry has done a lot of bragging about how PIWC set a pattern for "Government - industry teamwork."

Since the initiative now comes from the Government rather than from industry, the suspicion of antitrust violation should be lessened. The new committee can insist that the secretary clear everything with the attorney general and get it in writing that the conferences and actions will not be made the basis of prosecution.

It will be the secretary's committee, appointed by and responsible to him, not a trade association. Presumably it will have no functions except to channel information and suggestions from the industry to the Government, and not in the reverse direction. Thus it should have no influence on the industry which might be construed as restraint of competition. What influence it will have on the Government remains to be seen.

This new organization may not be much like the late PIWC in its operations, though its makeup may be similar, but at least it will give the industry a chance to blow off steam and get its views before responsible officials via recognized channels.

National Oil Policy

ADOPTION of a national oil policy for the United States is one of the immediate objectives of Secretary Krug. To accomplish this he has the Interior Department busy on an inventory of all natural resources which he hopes to have completed by fall. Then he will lay the findings before industry groups and try to get agreement on just what our situation is regarding petroleum and other important resources.

Instead of continuous controversies about whether or not we are running out of oil (or iron ore, or lead, or lumber). Krug wants to get the facts laid out on the line. Once there is agreement as to facts, he figures, it should be relatively easy to outline an intelligent set of policies for both Government and industry to follow.

As for petroleum, Krug thinks it makes little difference whether our reserves will last 10 years or 50 years; the important thing is that we should adopt the twin policies of conserving what we have and encouraging the development of additional reserves. He has no preconceived notions of how to do either but wants to sift the ideas of all people whose opinions count. This will be done through the medium of public reports and industry conferences.

The new secretary intends to devote the major portion of his time this summer to completing this inventory and forming the basis for national-resource policies. He doesn't even know the outline yet, but is confident that definite programs will result, replacing the confused arguments and special pressures which have surrounded discussion of our resources.

He believes that all natural resources will fall into three groups so far as national policy is concerned. In one group will be those which are critically short and without much hope of new discoveries. These will call for rigid conservation, reliance on imports, and stockpiling for national defense.

At the other extreme will be resources in tremendous abundance. We should expand the uses of these, and encourage their substitution for scarcer materials.

In between will be resources not immediately short but which require a policy designed to expand reserves, discourage waste, and develop new techniques for utilization of low-grade and high-cost sources.

His hope is that he can state the facts so clearly that the solution will be obvious, and that American business can support an intelligent and practical program for all our resources.

Tidelands Case

THE Supreme Court and the Senate both were told last week that since the adoption of the Constitution it has been the settled law of the land that submerged lands belong to the states and not to the federal Government, and that nothing has happened recently to unsettle this doctrine in the slightest.

In the Supreme Court, Atty. Gen. Robert W. Kenny of California filed a brief answer to the Government's suit claiming title to the oil deposits submerged off California's coast. Earlier he had filed an answer of 850 pages which the court said was too long. His second attempt was shorter, but could have been boiled down to approximately one sentence: In 54 decisions over a period of 100 years the Supreme Court has held that the states own the lands under navigable waters.

That sentence, however, appeared in the report of the Senate judiciary committee which, though coincidence, was filed on the same day. By vote of 8 to 6 the committee recommended passage of H.J. Res. 225, already approved by the House, to quiet title of submerged lands by declaring that the federal Government has no claim to them. While the committee majority was not large, the logic of the report should win many votes in the Senate. Here are some of its points:

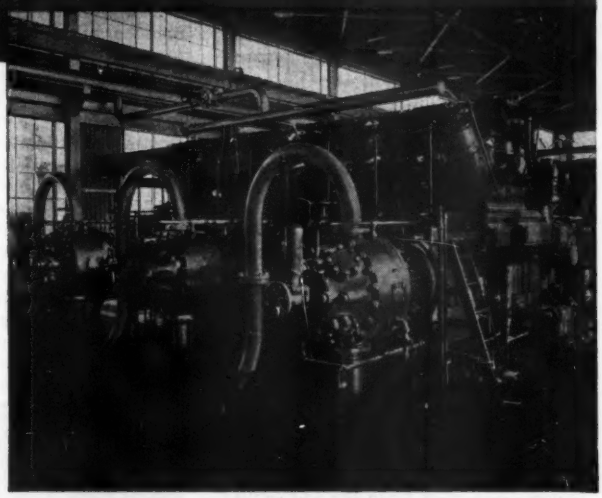
The resolution does not give away anything to which the United States has any justifiable claim, but merely removes a cloud from the judically established title of the states and their grantees caused by assertion of claim by certain federal administrative officials.

The chief connection of oil with this resolution is that applications by private interests for oil-drilling permits furnished the first occasion in the history of the nation for a claim that the states did not own lands under navigable waters.

No distinction can be made in claim of ownership between any submerged lands, whether under salt or fresh water, whether filled or unreclaimed, whether under harbors or the high seas, and whether they contain oil, oysters, or anything else.

...on the PANHANDLE EASTERN line

... modern in every respect ...
... in every respect reliable!



Close-up view of one of the GMV compressors. Each unit is rated 1,000 hp, has 10 power cylinders, and in this case drives three compressor cylinders. The dependable, long-lived GMV, with its V-type, 2-cycle engine, is exceptionally compact, remarkably easy to maintain.

The first Cooper-Bessemer compressors built for the Panhandle Eastern pipeline were installed back in 1930 — big, rugged horizontals. As this great gas line grew, more Cooper-Bessemers were added . . . again and again. Today, the figure exceeds 90,000 hp — and with additional horsepower on order.

Through the years, Panhandle Eastern Pipe Line Company has recognized and evaluated the sound design, careful workmanship, and reliability that have always been No. 1 "musts" in Cooper-Bessemer production. That's why they reordered Cooper-Bessemers with each expansion.

The five compressors shown opposite are the first Type GMV's to be installed on the Panhandle Eastern line. Modern in every respect, these GMV angles are exceptionally compact, permitting important installation and housing economies. They have exclusive features and new design refinements that assure exceptional flexibility and long range efficiency. And, from base to water-cooled exhaust manifold, they have the engineered stamina and come-what-may reliability for which Cooper-Bessemer compressors of all types have long been noted. When you think of plans for the future, think of GMV.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

Plans Disclosed for Merger Of Sunray and Transwestern

PLANS for a merger of Transwestern Oil Co. into Sunray Oil Corp. in a transaction involving more than $52,000,000 in stock and cash were disclosed last week in a joint announcement of C. H. Wright, Sunray president, and A. A. Seeligson, Transwestern president.

The proposed merger is subject to the approval of about 18,000 holders of Sunray stock and some 2,000 Transwestern stockholders. Sunray securities must also be distributed to the public through an underwriting group to be organized and managed by Eastman, Dillon & Co. The merger is expected to be finally consummated in about 3 months.

Through the merger, Sunray will acquire producing properties owned by Transwestern in four states and nonproducing acreage in nine states. In 1945, Transwestern produced 13,669 bbl. of oil daily and completed 35 oil wells, three gas wells, and 18 dry holes.

As shown in the 1945 statement of the company, Transwestern had an interest in 635 oil wells, owning 396, and in 39 gas wells, owning 30. The oil wells, net, consisted of 167 in Kansas, 40 in Oklahoma, and 188 in Texas.

Gross acreage held by the company and oil production in 1945 was Illinois, 131 acres, 2,504 bbl.; Kansas, 10,202 acres, and 1,142,428 bbl.; Oklahoma, 2,891 acres, and 507,044 bbl.; and Texas, 59,192 acres, and 3,027,361 bbl. The total amounted to 72,416 acres and 4,679,337 bbl.

Transwestern's nonproducing properties included 305,495 acres and royalties on 61,760 acres. Producing royalties totaled 309,666 bbl. Total assets of the company were $16,285,837, against $13,808,952 in 1944.

Transwestern is solely a producing company. In 1936, it took over the Slick-Urshel oil properties, and offices were moved from Oklahoma City to San Antonio where it now operates.

Though an integrated company, Sunray produces oil substantially in excess of its refinery requirements. The company has been characterized by rapid growth through mergers and acquisitions in recent years. Early last March, it announced its purchase of a 7,000-bbl. daily capacity refinery and 25 producing wells near Santa Maria, Calif., from Bell Oil & Refining Co. of California.

Gross income of Sunray in 1945 was $12,767,194 and net income $1,818,871, with earnings amounting to 54 cents a share. The gross income rose from $7,813,454 in 1943 to $11,361,293 in 1944. Sunray's net production for 1945 was 6,574,077 bbl. compared with 5,656,729 bbl. in 1944. Daily average net production was 18,011 bbl. Gas produced and sold during the year totaled $389,887. The merger company will have a production of about 35,000 bbl. daily.

In negotiations leading up to the merger agreement by the boards of directors of the two companies, it was reported Transwestern officials insisted all its employes be retained for a year.

Under terms of the agreement, Sunray will pay about 50 per cent cash and 50 per cent stock for Transwestern. Holders of Transwestern capital stock will receive for each share $70 in new preferred Sunray stock at par. This will be the only outstanding preferred stock of Sunray, the announcement said.

If the merger becomes effective, Sunray will invite tenders of preferred stock at par during a limited period and will purchase at par and retire preferred stock up to $25,500,000 par. If tenders in excess of the amount are received, purchases will be prorated.

Sunray Oil Corp., now in the process of acquiring Transwestern Oil Co., is headed by Clarence H. Wright, president. Elected a director of Sunray in 1921, Wright became vice president and general manager in 1923 and was elected president in 1930. Under Wright's leadership, Sunray has grown from a firm with 30 employes and production in one state to an integrated company with 20,000 stockholders and assets of more than $33,000,000.

The company presidents said it is contemplated that prior to the effective date of the merger, Transwestern will transfer to a new corporation all its producing and nonproducing oil and gas royalty interests for $750,000 and that the new corporation will offer to Transwestern stockholders pro rata all the stock of the corporation to be initially outstanding for an aggregate purchase price of $750,000.

Besides Wright as president, other officers of Sunray include F. B. Parriott, chairman of the board; R. Elmo Thompson, executive vice president; F. L. Martin, vice president for refining; H. S. McClintock, vice president for land and geological, and Harry H. Mack, vice president for production. In the Transwestern organization, Wesley G. Gish and James K. Ellis are vice presidents, and George W. Grant is secretary.

Cities Service Planning Construction Program

NEW YORK.—More than $50,000,000 in new construction, refinery improvements, and natural gas facilities are planned by the Cities Service organization as soon as manpower and materials are available, W. Alton Jones, Cities Service Co. president, told stockholders last week at the annual meeting in Dover, Del.

The refining construction part of this program will get under way in the Chicago area at an initial cost of $18,000,000. A large increase in capacity is planned.

In the natural-gas field, Jones said that the Cities Service Gas Co., a subsidiary, intends to construct a 400-mile 26-in. natural-gas pipe line from the Hugoton field to augment increasing fuel requirements in Kansas City and throughout the midwestern area served by the company. This area includes Kansas City, Topeka, Wichita, Hutchinson, and Leavenworth, Kans.; Kansas City, St. Joseph, Sedalia, Springfield, and Joplin, Mo.; as well as more than 250 other communities in Kansas, Missouri, Oklahoma, and Nebraska. The construction costs are estimated to be in excess of $25,000,000.

Summarizing operations of Cities Service companies for 1945, Jones stated that subsidiaries refined 17 per cent more oil than in 1944; sold $358,000,000 worth of products and services, as against $331,000,000 in the previous year; sold 3,000,000,000 gallons of petroleum products, 15 per cent more than the record year of 1944, and 265,000,000,000 cu. ft. of gas, 12 per cent above the 1944 figure, an all-time high.

Baden Made President Of Anchor Petroleum

W. A. Baden, vice president of Anchor Petroleum Co., has been elevated to presidency of the concern and its various divisions. At 37, Baden becomes one of the oil industry's youngest major executives. He was one of four founders of the company

W. A. BADEN

J. S. FEROE

in 1940 and has aided in guiding the concern in its growth.

The directors also named J. S. Feroe, assistant to the vice president in charge of sales of Hanlon-Buchanan Co., to head Anchor's natural gasoline sales department. Feroe, who is 36, is well known in oil circles.

In 1933 Baden became connected with Warren Petroleum Corp., leaving in 1940 to form, together with Paul R. Smith, L. F. Rooney, and B. B. Blair, the Anchor company.

Housebrand Gasoline Price Rises 1/8 Cent

PREDICTIONS of generally better prices for refinery gasoline were becoming a reality this week, after the quotation for housebrand in the Mid-Continent area climbed another ⅛ cent.

Most sales ranged from 5½ to 5⅝ cents for 73-75 octane, although minor offerings at 5½ and 5⅜ were reported. No large quantities of this under-the-market gasoline were believed to be available, however. Premium grade was reported ranging upward from 6⅛ cents.

The continued stimulus for the market appeared to result from several factors. Principal among these were buying by major companies to satisfy requirements of jobber contractors acquired during the war, further indications of removal in the near future of oil-price controls, and unexpectedly heavy consumption with greater demand likely when the summer traveling season begins.

A buoyant market in refinery gasoline also was apparent on the Gulf Coast. Marketers reported regular selling at 5⅝ to 5¾ cents. The high of these quotations was at ceiling. Strengthening of the Gulf Coast market brought a 1/10 to 2/10-cent advance last week by Socony-Vacuum Oil Co., Inc., on regular and premium at both tank-car and tank-wagon levels in the New York area.

In California, a marked gain in export business — though still under prewar levels—was reported. In recent months, Russia negotiated contracts for several hundred thousand barrels of gasoline and other products.

Levels of many products in California are reported already below working levels, and in view of a possible shortage of some products, marketers seemed not anxious to dispose of present stocks.

Gasoline demand for the week ended April 27 stood equal to the year-earlier figure which was swollen by huge war requirements. Total demand was 2,233,000 bbl. daily. During the April 27 week, gasoline stocks declined 1,428,000 to 99,631,000 bbl. It was the first time in 14 weeks that stocks were below the 100,000,000-bbl. mark. Production of gasoline hit 14,228,000 bbl., highest in 15 weeks.

Kerosenes and distillate fuel oils, which were critically short a few months ago, appeared to be abundant in most areas as demand slackened. Residual fuel oil was still tight throughout the country with observers expecting a rise in the price of this product when and if price controls are removed.

Drilling Improvements on Program at Pittsburgh

PITTSBURGH.— War-born improvements in drilling and secondary recovery methods will be highlighted at the June 13-14 meeting here of American Petroleum Institute's spring production meeting.

Wartime conditions caused cancellation of the 1945 session and plans are going forward to make the June 13-14 gathering a victory meeting, according to S. M. Vockel of Dun-Mar Oil Co., Pittsburgh, a member of one of the committees on arrangements. Hotel reservations should be made early, he said.

Housing Group Named for Chicago A.P.I. Meeting

NEW YORK.—Establishment of a housing committee to arrange for hotel accommodations at Chicago for the expected record attendance at the twenty-sixth annual meeting of the American Petroleum Institute November 11-14 was announced last week by William R. Boyd, Jr., A.P.I. president.

The committee consists of L. S. Wescoat, chairman, and Sheldon Clark, B. L. Majewski and A. W. Peake. Boyd said that the committee is presently engaged in making the necessary arrangements for accommodations and that an announcement will be sent to all members of the Institute by May 15 explaining how reservations can be made through the committee.

DEATHS

Charles V. C. Bradley, 75, who retired in 1936 after 40 years' service with South Penn Oil Co. and with Magnolia Petroleum Co., died April 27 in Little Rock, Ark. Bradley was general field superintendent for Magnolia for 17 years.

McDowell Gray, 66, superintendent of the lubricating oil department of Continental Oil Co. prior to his retirement in 1944, died April 26 in Ponca City.

Robert Roy, Sr., 70, oil producer of Bradford, Pa., died April 29 in Bradford.

James D. Walker, 68, associated with Hughes Oil Co., Chicago, 15 years prior to his retirement last March, died April 28 in Chicago. He at one time was connected with the old Western Petroleum Co. and with Taxman Refining Co.

Vern A. Hardin, in charge of the land exploration department of Crown Central Petroleum Co. at Shreveport, died April 30 in Shreveport. He formerly was a geologist for Carter Oil Co. in Tulsa and later associated with Powers Oil Co. in Louisiana.

Natt H. Hall, 62, employment agent for the Baytown, Tex., refinery of Humble Oil & Refining Co., was found dead May 1 in his room at Baytown.

Harold D. Crawford, 51, president of Maloney-Crawford Tank & Manufacturing Co., died May 5 in Tulsa.

Marvin E. Wadsworth, 55, Longview, Tex., oil operator, died May 1 in Shreveport.

Frank G. Hulse, 49, land and title investigator for Jarvis & Marcell Oil Co., died May 1 in Shreveport.

John M. McKinney, 86, who worked for Sinclair Oil Co. through southern Oklahoma and later for Lew Wentz Oil Co. in the Tonkawa, Okla., and the Three Sands area, died in Oklahoma City May 1.

James E. McClelland, 70, an official of Sinclair Prairie Pipe Line Co., died May 4 in Independence, Kans.

THE editorial in the Journal's April 13 issue on "Postwar Exploration" has been the subject of wide discussion among exploration scientists and petroleum engineers. In that comment, reviewing the early history of the geologist's entry into the industry, it was pointed out how large and complex the science of oil exploration has become. The future trend, the editorial stated, demands a greatly expanded research program, and simultaneously greater coordination and cooperation among engineers, geologists, geophysicists, and paleontologists.

Here are presented expressions from representative geologists and engineers who play a vital part in finding oil.

Financial Support Seems Assured

Sirs:

I noted with considerable interest, the emphasis on research in your editorial on "Postwar Exploration."

The activities of the research committee during the past year have been given a reception which clearly indicates the need for a cooperative research program sponsored by the A.A.P.G. Ira H. Cram in his presidential address in 1945 predicted that "the sizable funds which may be available for (cooperative) research will probably not come out of hiding until a well-thought-out, comprehensive program of research has been developed and recommended by those qualified to speak with authority. In the field of petroleum geology the association is certainly qualified to speak with authority and should speak."

Preliminary surveys of research in petroleum geology have been completed by the research committee during the past year and several major fundamental projects have been selected. These projects will be blue-printed during the coming year and will be presented to the executive committee for the formal approval of the association.

I have full confidence that those projects which emerge from the processes of survey, formulation, and review will receive the financial support of the oil industry and of other agencies who are interested in financing geological research.

SHEPARD W. LOWMAN,
Chairman, Research Committee, American Association of Petroleum Geologists, Houston.

Geologists Keenly Feel Need for New Tools

Sirs:

I am pleased to see the backing which The Oil and Gas Journal is giving the geologists, particularly with reference to their plans of research.

Noah Webster says "Research: (1) Careful or diligent search; a close searching. (2) Studious inquiry or examination; specif. and usually critical and exhaustive investigation or experimentation having for its aim the discovery of new facts and their correct interpretation, the revision of accepted conclusions, theories or laws in the light of newly discovered facts or the practical application of such new or revised conclusions."

Research is more ancient than present man. It is his ability to search out new data and apply their correct interpretation that has placed man so far above all creatures of the earth and made him what he is today. Our advancement can be measured in terms of new ideas, new ways of doing things, new discoveries, all conceived and developed by some form of diligent search or research.

Research is inherent in mankind, but all men are not research minded, and in the past only a given few have realized its far-reaching importance. The tendency to let well enough alone, "do things as they were done in the good old days," to be complacent, is dangerous in any line of thought or work. The multitude of discoveries and developments in many fields achieved through research during the past few years has been so outstanding that we are more conscious of their benefits and values than ever before. This frame of mind, this consciousness of what can be done through research, should be fostered. We do not want to go back to the "good old days." We want better ones for the future.

The petroleum geologist is perhaps better qualified than anyone else to appreciate the kind of work and the vast amount of work which he has been called upon to do to make possible the maintenance of our favorable proved petroleum reserves position during the past 5 years. Every resource at his command was put to work. Every tool and method that he knew about was used in the endeavor to find new oil. Although the results achieved are very gratifying, the petroleum geologist keenly feels the need for new tools and new methods to aid in the search for new sources of petroleum—not that the old methods and tools are worn out and no longer usable, for they are still good and can and will be used. But it has been becoming more and more apparent to the explorationist that if the United States is going to maintain her favorable proved oil position, we cannot rest on our laurels; we must devise new tools, new methods, and new thinking. No outstanding new developments in geology or geophysics which give better or cheaper ways of finding petroleum have come into successful practical application during the past 4 or 5 years. There have been some improvements, but they are not enough.

The field of petroleum geology, including geophysics, which is but one of the important tools of the geologist, is very broad and many of the criteria used in solving geological problems are based on data and laws derived from such sciences as mathematics, physics, chemistry, engineering. I have thought for many years that some of our generally accepted criteria are too vague, our units of measurement too approximate, and that they could be improved by calling upon experts in those sciences to aid in solving certain specific problems relating to earth sciences. In fact, there are a large number of geological research problems the solutions of which are impossible without the aid of chemists, physicists, mathematicians, etc., but the geologist alone can provide the indispensable geological supervision in the coordination and application of the findings of the other sciences to the geological problem.

Such was the thinking that prevailed among geologists assembled at the recent American Association of Petroleum Geologists convention in Chicago. The Oil and Gas Journal editorial of April 13 stated the case very well: "The future, as outlined at Chicago, is to be spearheaded with expanded research. In common with other operating divisions of the oil business, petroleum explorationists are in agreement that the coming years must have the sound base of many-headed research findings."

There is no doubt in my mind that the petroleum geologist is fully aware of the importance of embarking upon a continuous active campaign of research in the fields of earth sciences which, in the end, will improve his knowledge and lead to new and better means for discovering more petroleum. The need for such a comprehensive program coordinating the various fields of exploration and related operations in the oil industry was emphasized at the Chicago convention. We must do more than act as catalysts; we must serve as an active agent in bringing about the desired results. We must impress upon the petroleum industry in general, and upon our management in particular, the importance of our problems and the need for the proper means of implementing them. We can spearhead the work but we need power behind the spear to drive it through all obstacles. It takes time, it costs money and it requires cooperation and coordination to carry forward such a program as outlined by the research committee of the A.A.P.G. That it will pay dividends in the end is certain.

G. C. GESTER,
Standard Oil Co. of California, San Francisco.

Scholarships Would Attract Able Young Men

Dear Sirs:

There are some points in your "Postwar Exploration" editorial on which I want to offer comment.

Petroleum, like other minerals, is a "one crop" substance and the available supply is only maintained and increased by discovery. Discovery is a complex art, which, because of its increasing difficulty, is becoming increasingly scientific. Discovery may be expanded through an increased volume of exploration effort which, in turn, is dependent on the price of crude oil and on the economics of the industry. It may also be expanded through higher-quality thinking. Sharpening the quality of the thinking applied to petroleum (and mineral) discovery, then, is one method of increasing our national supply of crude oil.

How may the quality of our discovery thinking be improved? The answer is obvious—by interesting discovery-thinking men in the colleges and universities of the nation in the earth sciences. Certainly the volume of discovery and production of oil and gas of the past 25 years is in part a function of the kind of students and training the school systems of the United States have provided and if we would increase discovery, one way to do it would be to improve the quality of the thinking.

There are several ways of improving the

quality of thinking that is directed towards discovery. If, as many believe, the best scientific brains of the incoming generation are not going into the field of mineral and petroleum exploration, then one obvious approach to discovery would be to attract some of this talent into geology and its allied sciences. This might be done on two levels, one precollege and one postcollege or graduate, through scholarships provided by the oil industry. These scholarships should be widely advertised and they would be won only by students of high mental capacity and imagination, coupled with common sense. Such a program would attract to the discovery problem of the oil industry a steady stream of the ablest young men in the country.

Its cost would not exceed one or two dry holes a year, and it is doubtful if the industry could, over a period of years, get more for its money than in some method of improving the thinking directed towards its problems. Not only would it supply itself with its share of the best thinking talent in the country, but it would attract favorable public attention to its chief problem and would thereby demonstrate its interest in solving it.

Certainly establishing expensive research organizations is not going to solve the problem of discovery unless they are manned by competent men, and these men must be trained in the universities. Training alone is not enough—there must be top-grade men to receive it. It is in the competition for these superior students that the oil industry is losing out to other industries and some method of attracting them must be provided.

A. I. LEVORSEN,
Stanford University.

Improvement Must Be Intensified

Sirs:

In your editorial on "Postwar Exploration," you have well expressed the trend of the times. As never before, research for new methods of exploration and for improvement of old methods must be intensified and expanded; and, as you say, this requires aggressive support from forward-looking management. I appreciate very much having an opportunity to read your excellent contribution.

F. H. LAHEE,
Sun Oil Co., Dallas.

Parallel Situation in Petroleum Engineering

Dear Sirs:

I have noted with considerable interest your editorial in the April 13 issue, with specific reference to cooperation in the geological group. A parallel situation exists in the sphere of petroleum engineering.

One particular example is the progress made on the problem of petroleum reservoir performance and the steps taken to secure maximum recovery from a pool. Such progress has been made through cooperation between the engineers in the laboratory and the engineers in the field. Other technical departments in the petroleum industry have contributed their assistance in their specialty. The final result of maximum accomplishment, with benefit to the industry and the entire nation, results from a further cooperation among petroleum producing companies, with the assistance of state regulatory agencies.

The petroleum division of A.I.M.E. is intended as a forum for the presentation of engineering ideas related to the development and production of petroleum. It is through this medium that the laboratory results from one company are made available to the technologists of another company. Field applications of engineering ideas in one area are explained for application to other areas. This exchange of ideas has assisted the technological progress of petroleum production in which the United States leads the world.

Our society of petroleum technologists hopes to go further than acting as a forum alone. The engineering research committee is studying the problem of coordinated research. It hopes to standardize the approach to many research problems, to eliminate duplication of research studies, and to provide a coordinated attack on major problems where the facilities of one laboratory or company are insufficient for complete coverage.

Executive support is an essential to these objectives, as you have pointed out. Technical men must be given approval from their employers to freely discuss their developments and accomplishments. They must have the opportunity to meet with others in their field and to exchange ideas. Financial assistance must also be provided for any cooperative efforts that result.

H. J. Beardmore,
Chairman, petroleum division, American Institute of Mining and Metallurgical Engineers, Tulsa.

Closer Cooperation Vital

Sirs:

Thanks for the pointed and timely editorial on Postwar Exploration.

Closer cooperation among geologists, geophysicists, paleontologists, and petroleum engineers, along with both the support and sympathetic cooperation of management, is believed vital in the finding and producing of oil in the future.

The projected "Case History Volume" of the Society of Exploration Geophysicists is a worth-while step in promoting such cooperation.

HENRY C. CORTES,
Dallas.

Outlook Never Brighter

Dear Sirs:

This editorial shows that you and your organization are keenly aware of the role of the geologist and the geophysicist in the task of keeping the wheels of America and the rest of the world turning.

The outlook for petroleum exploration on a world-wide basis has never been brighter with ever increasing demand being made on our widely scattered activities. As oil exploration and development moves forward we are certain your publications will always be G-2 in the oil fraternity.

G. H. WESTBY,
President, Seismograph Service Corp., Tulsa.

Policy Paying Dividends

Sirs:

The editorial on "Postwar Exploration" presents a true picture of the situation in my opinion. Greater coordination is necessary and is forthcoming in those organizations that are recognized as the leaders in exploration and technological development. That this policy is paying dividends is borne out by the ascendency of forward-looking companies and individual operators in recent years. Everyone in the industry recognizes those companies to which I refer.

Executive support is certainly essential for fulfillment of the objectives outlined in that editorial. It will not be secured without it. One phase of support that has gone unnoticed is in the compensation of the geologists, engineers, and geophysicists that are going to have to carry out this program. So long as nontechnical help is better paid than the technical men in charge of well operations, as has often been the case during the war years with time-and-a-half and double-time, employers of technical men are going to find their staffs loaded with dissatisfied, unenthusiastic, and incompetent men.

It has always been my observations that the better geologists are usually the better-paid geologists, and I presume this applies equally well to engineers and geophysicists. Those executives who are willing to pay only a bare living wage for their technical help are going to find themselves falling back farther and farther in the race for new crude reserves. Those companies who have followed a parsimonious policy in this regard must now find themselves handicapped by it.

"Oil is where you find it" to be sure; but those who **know** where you find it, find the most oil. The record proves this.

Please accept my thanks for the manner in which the Journal covered our convention and our problems. You have done the profession a real service. If the above comments can do a little bit to further "the cause," you may feel free to use them. They are, of course, personal opinion and do not reflect the opinion of the association or its executive committee.

EDWARD A. KOESTER,
Vice president, Darby & Bothwell, Inc., Wichita.

Real Service to Industry

Sirs:

I believe all members of the association were highly pleased with the "geological number" of the Journal published the week of our meeting in Chicago. It seemed to me that the space you allotted was generous and the discussions you prepared were very capably written, all to your credit and to that of the American Association of Petroleum Geologists.

The editorial on "Postwar Exploration" was a splendid discussion of this subject. Likewise your contributions regarding the association's research program have been excellent in style and content. These words of praise are spoken sincerely and sent to assure you of our appreciation and thanks for real service to the industry during the past year.

M. G. CHENEY,
Past president, A. A. P. G., Coleman, Tex.

Diesel Makers to Aid In Research on Fuel

CHICAGO.—Twenty-two representatives of diesel engine manufacturers have been designated as a group to assist an oil industry committee in a program aimed at improving diesel fuel performance.

The group was designated by E. J. Schwanhausser, president of the Diesel Engine Manufacturers Association. They will work with the automotive diesel fuels division of the Coordinating Fuels Research Council which is headed by Dr. D. P. Barnard, Standard Oil Co. (Indiana), as division chairman. The oil industry committee was to meet this week in Chicago to receive views of railroad representatives on the problem. The diesel-fuel committee of the Western Petroleum Refiners Association also scheduled a meeting this week in Chicago to consider possible changes in its own program which is being carried on in cooperation with the other groups.

OIL-POOL Analyzer

by Dr. W. A. Bruce

DR. W. A. BRUCE, author of this article, is shown testing the pool unit of the electronic reservoir analyzer. The electrical contacts with white colored circles on top are "oil wells," those with white squares are "input wells." A physicist, Dr. Bruce has been with the Carter Oil Co. for 8 years. He received his undergraduate training at University of Kentucky and completed a year of postgraduate work in physics and chemistry there. He spent 1½ years in refining work, then 1 year in research on X-rays and crystal structures at Washington University, St. Louis. He served 2 years as a university fellow doing research on thermal vibrations of atoms, and received his Ph.D. degree from Washington University.

THE electrical oil-pool analyzer was developed in the Carter Oil Co. laboratories in 1942 to aid in the study of certain types of reservoir engineering problems. With this device, both analyses and predictions of reservoir pressure-production behavior can be made for most petroleum reservoirs in which water influx is an important factor. With sufficient pressure, production, and stratigraphic data for a pool and its surrounding aquifer, the presence of a water drive can be detected with this instrument long before it becomes obvious. The expected power of this water drive and its ability to continue into the future can be predicted. Other effects, such as that of water injection or of unusual production from selected wells, can be anticipated.

Although there have been mathematical methods which might be used for this work, they all have two disadvantages: (1) They require a large amount of highly skilled mathematical work to be carried through to successful completion; and (2) Problems are continually arising which have such complex boundary conditions that no mathematical method now developed can be used except for an approximate solution.

History of Development

The development of Carter's oil-pool analyzer, like many inventions, was the result of a number of developments in associated fields. In 1822, Fourier[1] showed that heat-flow problems were amenable to mathematical solution and in 1842, Kelvin[2] showed that diffusion could be handled by solutions of the same equation. In 1934, Hurst[3] of Humble Oil & Refining Co. and Muskat[4] of Gulf Oil Corp. independently showed that this same diffusion equation could be used to describe the behavior of compressible liquids in homogeneous porous media. Their work was further extended in 1939 by some work[5] at Carter.

These mathematical developments laid the groundwork for the analyzer,

New Tool Offered Royalty Free to Industry

A SPECIAL demonstration of the new electronic oil-pool analyzer described in this article was given at the Tulsa research laboratories of its developer, the Carter Oil Co., on May 2. The pool analyzer has been in process of development and use for several years, and it should play an increasingly important role in petroleum engineering. In effect, the machine takes the known technical and producing information about an oil pool and projects far into the future the operating procedure for the wells so as to indicate how the greatest amount of oil can best be recovered. The electric robot, in fact, will solve some intricate problems which are almost incapable of solution by mathematical means. The device assimilates information about an oil field, digests it, and comes up with answers to difficult problems in 5 to 10 minutes. Basic principle of the analyzer is simple. Oil and water, under pressure in an underground sand, behave like electricity "under pressure," in condensers and resistors. The analyzer can determine what pressures should be sustained in an oil pool to get maximum efficiency; it can compute the best rate of withdrawal from a pool to insure the greatest ultimate recovery; and it can tell how much water or gas should be pumped back into the ground to build up pressures which would make older wells produce more economically and profitably.

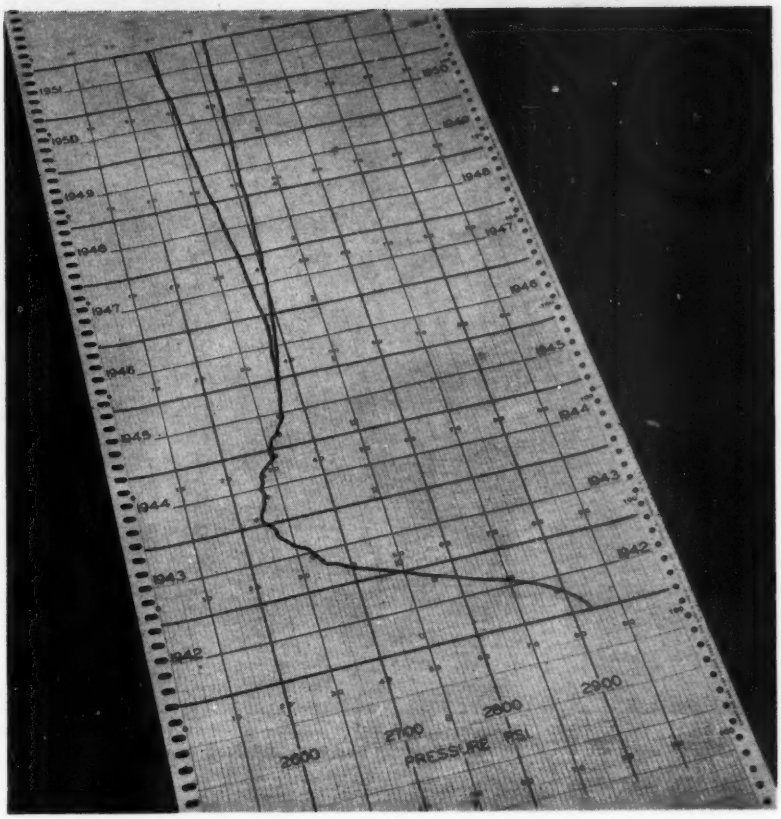
Speaking at a dinner, following the demonstration, which was attended by a group of oil men, scientists, educators, and representatives of associations in the industry, President O. C. Schorp of the Carter Oil Co. offered the device "royalty free" to the American petroleum industry.

but it was the development of a machine for studying heat flow which led to the conception of an electrical device for studying reservoir behavior. In 1937, C. L. Beuken[6] showed that a network of capacitors and resistors could be assembled in such a way that the flow of electricity in the network would be analogous to the flow of heat in a solid body. In 1941, Victor Paschkis[7] working for the Research Corp. of Columbia University, constructed the first heat-flow analyzer in this country. With this background, the electrical analyzer for studying reservoir behavior was designed and built in the Carter research laboratories in 1942.[8]

Basic Theory

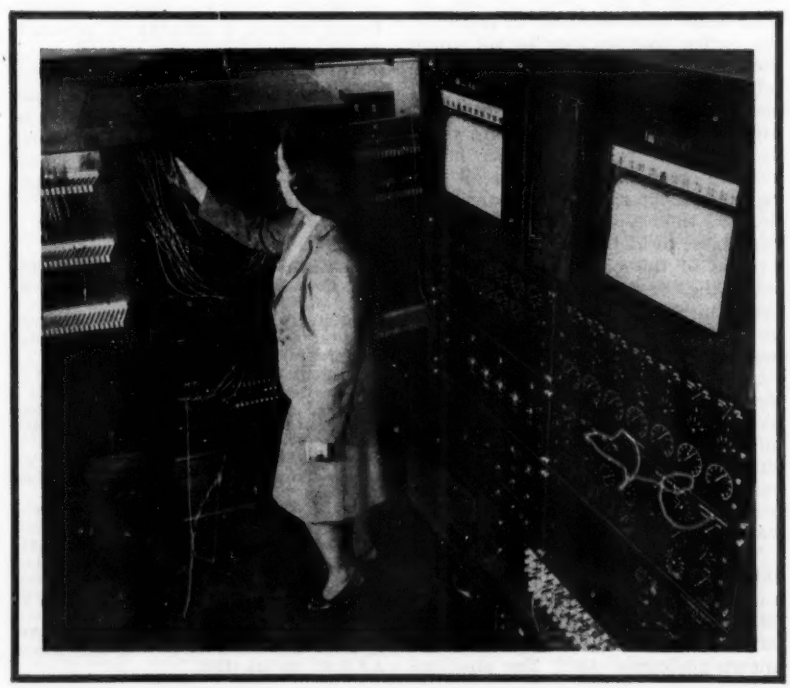
The basic theory of this analyzer rests upon: First, the analogy between the conductivity of an electrical conductor and the conductivity of a porous medium; and second, the analogy between the ability of a porous medium to produce stored fluid by virtue of the compressibility of the fluid and the ability of a condenser to release stored electrical charge.

Although it is well known that petroleum reservoirs and the associated aquifers are characterized by lithological complexities, it has been found that local variations in the permeability and porosity of porous media average out in cases involving the movement of a large volume of fluid through a large cross section of porous stratum. It has been found that, with suitable adjustments of the analyzer, widespread variations can be taken care of in the analysis with accuracy comparable to the accuracy of the knowledge concerning these discontinuities. Therefore, the basic theory of the analyzer is described for the simple case, in which the producing formation is a large blanket-like, homogeneous and uniformly thick porous medium.



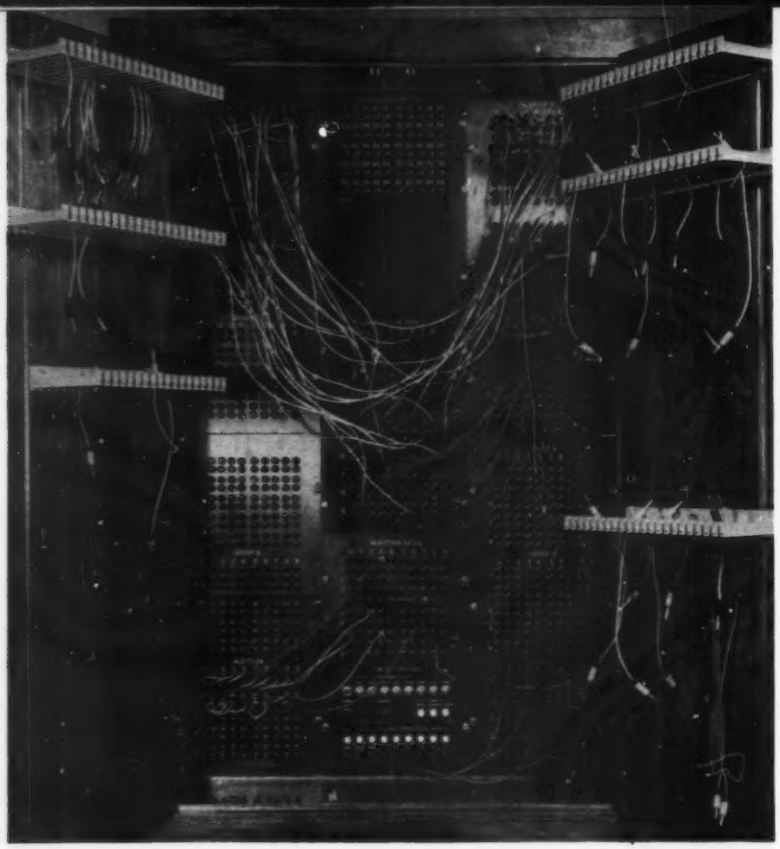
This chart is the 10-year bottom-hole-pressure history, as calculated by the analyzer, of the Midway, Arkansas, oil field. The small circles in the 1942-1945 intervals are actual field-pressure measurements, and coincide almost perfectly with the curve. The two curves between 1946-1951 are analyzer predictions for two different future operating procedures

Two principal units of the new oil-field analyzer. The recording instruments at upper right make permanent charts of future bottom-hole pressure and water-drive behavior



Imagine a small zone of this porous medium and for the moment imagine this zone to be bounded on all sides by impermeable walls. The fluid contained in this zone is under pressure; hence, by virtue of its compressibility and also because of the deformability of the porous medium, some of this fluid could be removed with a corresponding decrease in pressure. Furthermore, it has been established experimentally that the decrease in pressure is approximately a linear function of volume of fluid removed.

This basic phenomenon of fluid expansion and pressure drop is analogous to the electrical phenomenon of a charged condenser from which a charge can be withdrawn with a voltage drop proportional to the withdrawal of charge. There is a similar analogy of resistance to fluid flow through a porous medium and the resistance to electrical flow through a



Many "sets" are available for production and injection rates, number of wells

resistor. Thus, because of these two analogies, the expansion of a fluid within a porous zone and the flow of fluid through this zone can both be represented by an electrical unit having capacitance and resistance.

Several resistance-capacitance units can be connected together to represent a large and complex liquid-filled porous medium. The oil-pool analyzer is such a collection of units. Because of the analogy, suitable adjustments of constants can be made so that currents may be discussed in terms of barrels per day and voltages in terms of pounds per square inch. Distances in the two-dimensional problem can be made to scale and the relationship between time for the analyzer and the time for the fluid system can be any convenient ratio. Thirty seconds corresponding to one year is the usual time scale.

The remainder of this device is composed of electronic units for regulating and measuring currents and voltages. One type is used for the automatic control of the current withdrawal from the condensers attached to the electrodes representing producing wells and the current input into electrodes representing the injection wells. These devices can be set to adjust these current rates automatically at intervals of 2½ seconds. For most problems, this corresponds to automatic readjustment of production and injection rates each month. Other electronic units are used to measure and record, at various points in the system, voltages which represent pressures at corresponding points of the formation and to measure and check the current flow between elements of the analyzer.

Two Classes of Reservoir Studies

There are two types of analyses and predictions which can be made with the analyzer. In Class 1, the pool contains a single-phase liquid and does not develop a gas phase during the time under consideration. In this case, the entire problem can be set up in the analyzer and studies made of the relationship between production and pressure or injection of water and pressure. Class 2 problems are those in which the reservoir either has a gas cap originally or develops a gas-cap phase later. For the consideration of this type of problem, it is necessary to determine the original volume of the oil zone and to consider the pressure-volume relationship controlling the behavior of gas in the reservoir by material balance methods. At the present time, this class of problem is being treated by the successive approximation technique, in which the pressure-water influx relationship as shown by the analyzer is compared with material balance calculations, which in turn permit an adjustment of the pressure-water influx curve.

The real proof of the analyzer's validity lies in its ability to follow a complicated pressure-production relationship with values for the capacitors and resistors compatible with known geological data. The analyzer has been used in a number of studies and has been able to follow the pressure-production history accurately in most cases.

A particularly satisfactory result was obtained in the Midway, Arkansas, pool case. Here, predictions were made on relatively short history. (The pool was discovered in January 1942 and the first study was made in April 1943.) The predictions made at that time indicated almost perfectly the effect caused by water injection.

In April 1944, another prediction was made by the analyzer, taking into account changes in field production and injection rates which had occurred. This prediction was checked again in late 1944 and early 1945 and it was found that the analyzer prediction followed perfectly the results obtained in the field.

A new electronic device has been given a preliminary trial and is being further developed for use in eliminating the mathematical step for the material balance part in the analysis of Class 2 problems (involving a gas phase). The operating principle of this new device is based on the fact that in any two-phase system, the reduction in pressure gives rise to a rate of expansion which is a function of the pressure, the volume of the individual phases and the time-rate of change of pressure. This can be expressed mathematically as follows:

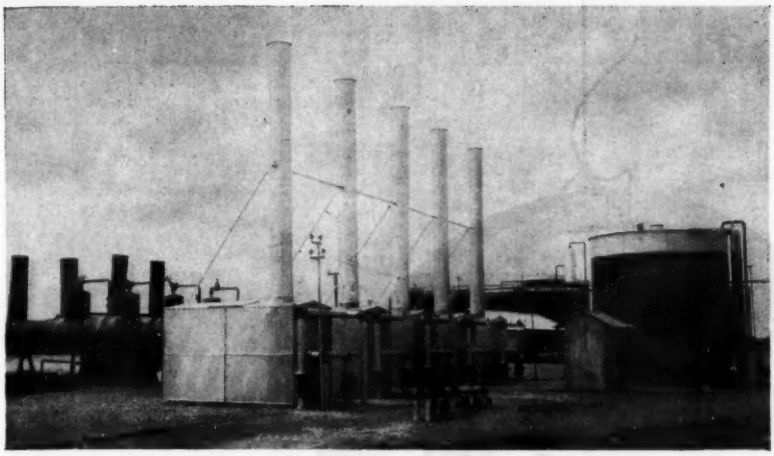
$$\frac{dv}{dt} = F(p, V_g, V_o)\frac{dp}{dt}$$

in which dv/dt is the rate of expansion and can be replaced by a hypothetical injection. F is a function of pressure, p: volume of gas, V_g; and volume of oil, V_o. The apparent rate of volume return is directly proportional to rate of change of pressure, dp/dt.

The electronic device which simulates this behavior is designed to deliver a current for injection into one or more of the pool unit groups, which is proportional to dp/dt and whose arbitrarily adjustable proportionality constant is the function, F.

References

1. Fourier, Theorie analytique de la chaleur, Paris, 1822, translated into English by Freeman, Cambridge, 1878.
2. Kelvin (Sir William Thompson): Mathematical and Physical Papers, Cambridge University Press, Vol. 2, 1884.
3. Hurst, W., Unsteady Flow of Fluids in Oil Reservoirs, Physics, 5, 20. (1934).
4. Muskat, M., Flow of Homogeneous Fluids Through Porous Media, McGraw Hill, (1937).
5. Bruce, W. A., Pressure Predictions for Oil Reservoirs, A.I.M.E. Petroleum Development and Technology 73-86 (1943).
6. C. L. Beuken, Warmverluste bei periodisch betriebenen Elektrischen Ofen, Elektrotechnik and Maschinenbau, 55, 232 (1937).
7. V. Paschkis and H. D. Baker, A Method for Determining Unsteady-State Heat Transfer by Means of an Electrical Analogy Method, Trans. A.S.M.E. (1942).
8. Bruce, W. A., Electrical Device for Analyzing Oil Reservoir Behavior, Trans. A.I.M.E., 112-124 (1943).



Boilers, heaters and tanks of Mene Grande treating plant at Oficina

Venezuela's Largest Chemical Emulsion Treating Plant

by Paul Reed

SAN TOME, Venezuela. — South America has the largest plants for treating oil-field emulsions by both the chemical and the electrical processes. Furthermore, in connection with their operation there are certain features which make these plants distinctive. These include the more extensive utilizing of excelsior tanks at plants of the chemical type, the greater application of electrical dehydration, and also the pronounced tendency to build increasingly larger plants.

While this article is concerned with the Oficina plant of Mene Grande Oil Co., which is the biggest chemical-type treating plant in Venezuela, it should be mentioned that the largest chemical type plant in the world is that of Tropical Oil Co. at El Centro, Colombia, and that the largest electrical (Petreco) plant in the world is that of Shell at Lagunillas on Lake Maracaibo in Venezuela.

Although the injection of chemical at the chokes of flowing wells generally results in obtaining optimum chemical ratios, this type of injection is not feasible on a large property where there are many feeders to be serviced requiring an amount of attention which becomes excessively burdensome. As a result there is a greater concentration of chemical injection at the plant or at intermediate gathering stations.

The Mene Grande plant at Oficina, incorporating efficient features of modern design, makes effective use of excelsior tanks. The purpose of excelsior is to give the water particles a higher percentage of contact surface and to insure that there is no surging in the tank. Excelsior can be used advantageously for these purposes where the oil treated is of low gravity and is emulsified with a brine of low salinity. For these functions excelsior has proved to be better than other materials. Steel wool, glass wool, gravel, steel shavings, and broken glass have been found in all cases to be wettable, not in water, but in oil and therefore they are of no value. In the United States excelsior is used less than in South America; in fact, outside of Talco, Tex., and Healdton, Okla., it is not used to a large extent.

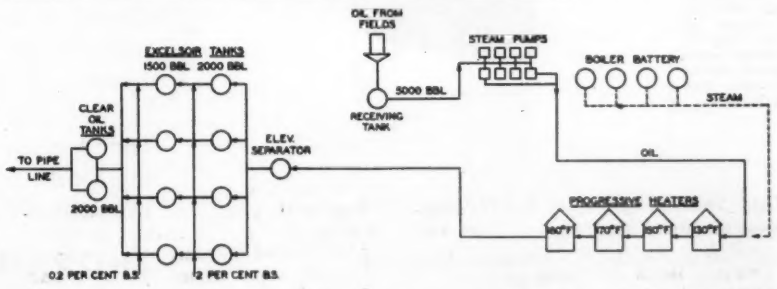
A feature of the Oficina plant is the use of a 5,000-bbl. receiving tank equipped with steam coils covered with water. Here oil coming from the field is held for a period during which it is subjected to "soft" heat, before the emulsion is pumped through the heaters to the excelsior (hay) tanks. This provision was adopted in the plant design because it had been noted in laboratory experiments for testing emulsions that a long period of settling at treating temperatures greatly aids the breaking of the emulsion. To avoid trouble due to the corroding of 2-in. steel coils, these have been replaced with copper coils of the same diameter.

Only 0.2 Per Cent Contamination

The Oficina plant of Mene Grande has been processing fluid with a plant output at the rate of 7,000 bbl. daily of clean oil with only 0.2 per cent contamination.

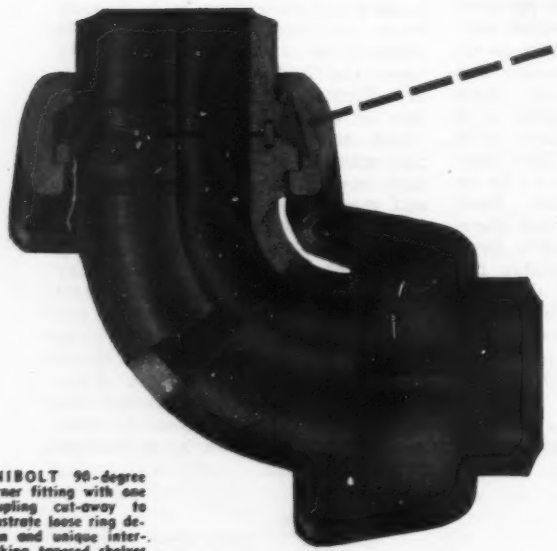
The company makes a practice of injecting Tretolite ahead of the chokes at wells with high percentages of emulsified oil. Some Tretolite is injected at gathering points and the remainder used is injected at the plant.

Oil from the field comes to the 5,000-bbl. receiving tank equipped with 2-in. copper coil covered with 4 ft. of water. From this tank it is pumped through a series of four heaters in which the temperature is raised progressively in each one as follows: 130°, 150°, 170°, and 180° F. Steam for the heaters is furnished by four 70-hp. boilers which will probably be replaced by five 90-hp. boilers. Both heaters and boilers are to be housed. From the heaters the hot oil is pumped to an elevated separator where the fluid is 30 per cent emulsified. From there it passes to the battery of eight excelsior (hay) tanks which are operated in pairs. Each pair operates in series with the first tank having a capacity of 2,000 bbl. and the second tank a capacity of 1,500 bbl. Flow is by gravity between them. There are no coils in the hay tanks. Oil coming from the first hay tank is 2 per cent contaminated and from the second hay tank 0.2 per cent contaminated. From the hay tanks oil goes to two 5,000-bbl. clean-oil tanks. Emulsion picked up at the weir of the sump is run through the plant. Water from the plant is evaporated in a pit. Clean oil is pumped to the tank farm.



Flow diagram of Mene Grande emulsion treating plant

ON THIS THREAD HANGS THE SOLUTION . .



UNIBOLT 90-degree corner fitting with one coupling cut-away to illustrate loose ring design and unique interlocking tapered shelves which place large area of metal in shear.

. . . to your furnace fittings problem

On this thread hangs a metal seal ring which is employed by UNIBOLT Streamlined Return Bends, Corner Fittings and other furnace fittings to effect a seal between the upset tube and the body of the fitting. Utilizing the same mechanical principle as the UNIBOLT Coupling which has set new high standards of efficiency in the drilling, production and pipeline divisions of the industry, the superior design of UNIBOLT Furnace Fittings has been proven in recent months on a number of unusual installations where furnace outlet temperatures range up to 1600 degrees F.

Refinery engineers who are faced with the problem of safely sealing light gases or corrosive charging stocks at temperatures above 1000 degrees F are invited to write for Bulletin RJ-42.

How This Seal Ring — In a UNIBOLT Furnace Fitting — Benefits You:

- Eliminates "rolled-in" tubes
- Absorbs creep
- Multiplies seat pressure
- Prevents header leaks
- Obviates need for steam in header boxes
- Eliminates tapered plug closures
- Eliminates seal welding
- Permits faster "heading up"
- Permits replacement of a single tube
- Is interchangeable

THORNHILL-CRAVER COMPANY

HOUSTON, TEXAS

UNIBOLT
REFINERY FITTINGS

Engineering Refinements Feature New Heavy Rig

by George Weber

This new "big rig" is powered with three engines totaling 975 hp. There are pneumatic controls for the different operating units, with the control levers and instruments centralized at the driller's panel. Rated capacity of the rig is 12,000 ft.

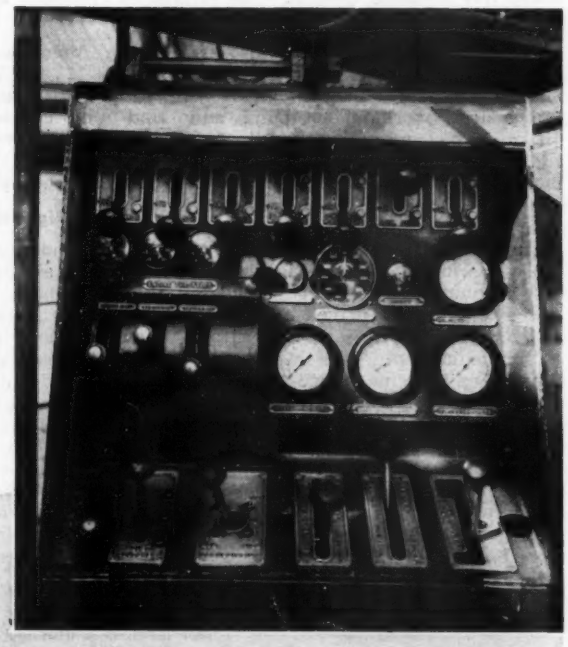
CENTRALIZED pneumatic control of all drilling operations and compact unitization comprise the principal features designed into a new heavy mechanical rig developed by Oil Well Supply Co. The first of this type rig to drill in West Texas is now in operation by M. J. Delaney Co., drilling under contract for Atlantic Refining Co. in the University Block 31 field of Crane County. Those concerned with its operation expect it to cut a month from the average 6-month period required to drill to the 10,500-ft. Ellenburger pay of the field.

The Delaney rig incorporates two new units: the Oilwell No. 96 draw works and the Oilwell No. 1000 triple-engine drive. Its rated capacity is 12,000 ft. with 4½-in. drill pipe. It is powered by three Waukesha engines delivering a total of 975 hp. at 900 r.p.m. The engines are butane fueled.

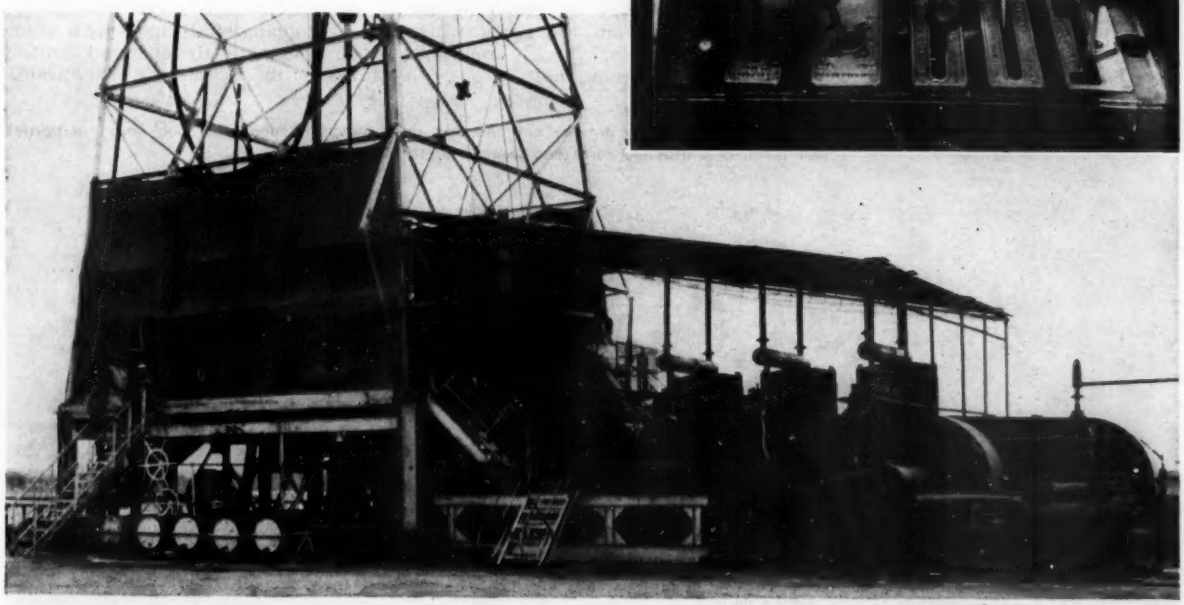
Other heavy-rig refinements make this unit adaptable to the difficult problems in deep drilling in the Permian Basin. The adequate reserve in hoisting and braking horsepower, sensitively controlled, is important in hard-rock drilling where the number of round trips per well is extremely high. Pressure-lubricated multistrand roller-chain drives and adjustable tapered roller bearings on all shafts and in all floating clutch sprockets and pulleys minimize power loss and failure under heavy loading. A self-contained draw works and protective guards on all drives seal moving parts from sand and dust in drilling and moving in the dry, windy climate of the area.

Controls Centralized

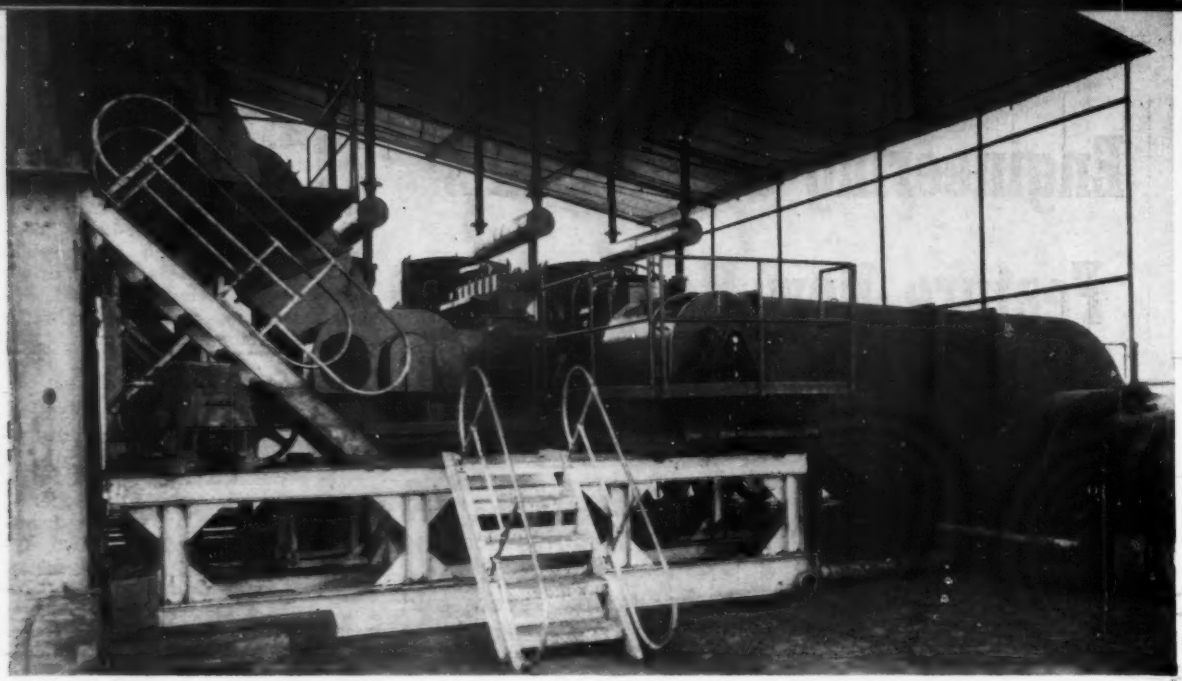
Designers of the rig have centralized all control levers and instruments in one panel located at the driller's position. Small hand levers actuate the air valves that operate all clutches in the draw-works transmission, on the compound drive, hydromatic brake, rotary pumps, and sand reel. Hand throttles in the panel control the engines singly or in compound, and the control may be transferred to a foot pedal for use in hoisting. Instruments showing air pressure, engine vacuum, transmission-



Control panel located at the driller's position. Levers pneumatically control engine clutches and throttles, engine compounding clutches, pump clutches, hoist, and brakes. Instruments show engine vacuum and oil and air pressures



The new Delaney heavy rig presents a compact appearance. Unitized metal racks for pipe and oil drums and standardized stair and floor sections promote efficiency and economy on the rig



All chain and V-belt drives from the compound to the draw works and pumps are completely enclosed. At upper left is the liquid-level control tank governing operation of the Parkersburg hydromatic brake. All units on the engine floor are mounted on skid-type sub bases

shaft speed, and oil pressure also are installed in this panel. An auxiliary instrument panel installed in front of the draw works shows pump and bit pressures and rotary speed. Two additional foot pedals at the driller's panel actuate the air-operated friction clutches to the rotary and automatic rotary-side cathead.

Complete pneumatic operation of the rig is made safe and dependable by adequate compressor capacity. Three compressors, driven individually by the three prime movers, afford an immediate pressure buildup on starting any engine. Since two compressors are capable of maintaining sufficient air pressure, the third is available as a virtual standby. The large dual-type air reservoir is mounted on the compound drive and is equipped with safety valves and water traps to remove all condensate from air lines.

The pneumatic system operates best at 125 psi. In case of emergency, clutches on compound, transmission, and pump can be operated manually. Engine and low-speed drum clutches can be locked in position allowing the rig to be operated without air.

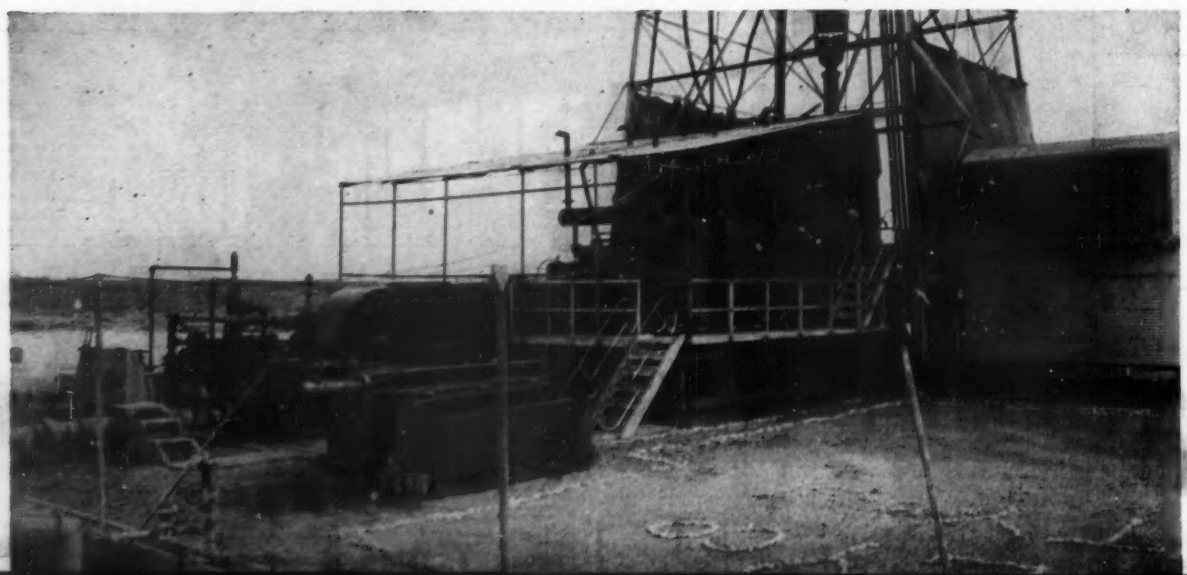
Rig Units Compact

Hoist and transmission are compacted in a single draw-works unit that will move in one load 21½ ft. long, 9½ ft. wide and 8⅓ ft. high, including core reel. Only the drive chains to compound and rotary are disconnected in moving. Covers are provided for guard openings to protect the unit from dirt and water in transit. An 8-ft. road clearance may be obtained without removing any additional chains, by unbolting the transmission from the draw works and disconnecting flexible couplings of the transmission shaft.

Three forward transmission speeds through sprockets and roller-chain drives, and one reverse speed through helical gears, in combination with high and low drum shaft clutches, give the unit six forward and two reverse speeds. Accidental engagement of two clutches simultaneously is prevented by an interlocking device on the transmission. A spline-type flexible coupling and a spline-type air-operated clutch connect transmission to the high and low-speed jack shafts respectively. Both jack shafts are in line with the transmission output shafts, relieving side pull on the latter. An extension to the low-speed jack shaft permits installation of a Brantley hydraulic feed control.

Shifting time is saved through instant stopping of all shafts by a band-type pneumatically operated neutral brake on the input shaft of the trans-

View of the rig from the slush-pit side, showing Waukesha prime movers and the two slush pumps. Beneath the dog house at derrick floor level, is a dressing room and lockers for the crew



In every oil field VISCO *is*

FAST
EFFICIENT
ECONOMICAL

...Visco not only treats it out more readily but does not take as large a quantity as other chemicals manufactured for this purpose...

...It was only necessary to use about half as much chemical for the same amount of treating...

VISCO

The Modern Emulsion Breaker

VISCO PRODUCTS COMPANY, INC., Houston, Texas

mission. Being controlled by the same lever which operates the master clutch of the compound, one movement of this lever disconnects all power from the hoist and stops all motion of hoist shafts.

The drum spool measures 28 in. diameter by 48 in. length and allows a trip into the 136-ft. derrick with two and one-half wraps of the 1¼-in. wire line, with eight lines strung. Extra drilling line is carried on a reel mounted on the derrick substructure, and is fed to the hoist drum via a snubber located at one corner of the derrick. The double roller chain driving the rotary is enclosed in a guard and lubricated by an independent spray oil system.

Full-wrap, combination-band and shoe-type brakes are series water cooled. A compound brake leverage system between the driller's hand brake and brake bands provides the driller with a high mechanical advantage in manual operation. The advantage may be further increased at the driller's option by an auxiliary air booster on the brake. When the brake is used for feeding off, the booster may be cut out by closing an air inlet valve. The Parkersburg double 40-in. hydromatic brake is controlled by a single-type air-operated clutch and may be engaged by the driller when going in the hole. The lever in the control panel is held in manually during this operation, and the brake automatically disengages as the lever is released. The same lever controls the high and low drum clutches. A Parkersburg liquid-level control tank governs operation of the hydromatic brake at varying drilling depths.

The power assembly breaks down into four units for moving. Each of the three prime movers is mounted on a skid-type subbase. Water and fuel to the engines are supplied through flexible lines connected to manifolds in the substructure. The fourth part of the power assembly is the unitized compound for draw works and pump drives, which is mounted in one piece on a separate skid-type subbase. Engine power is transmitted through three Airflex friction-type clutches which operate as high-speed flexible couplings to the three shaft assemblies in the compound. No. 1 engine shaft is equipped with an interchangeable multidisk friction-type clutch for driving the draw-works transmission and Nos. 2 and 3 shaft assemblies are connected through the same type clutches to V-belt pulleys mounted between pillow-blocks for driving the slush pumps. Multichain drives on all shafts with spline-type clutches on Nos. 1 and 3 engine shafts provide any combination of power transmission to draw works or pumps. Engine mufflers will carry water to quench all sparks when the rig is drilling gaseous formations.

Two slush pumps are installed on the rig; a 7¾ by 20-in. main pump and a 7¼ by 18-in. auxiliary. Both pumps are equipped with safety air valves located at the pumps, allowing the pumper to release control from the driller's position while he is working on them. Dual mud lines lead from the pumps to twin standpipes in the derrick providing a standby rotary hose. Although pits are employed at present, the contractor plans to install mud tanks on the rig's next location to reduce seepage and contamination. Jets and standpipes are equipped with interchangeable couplings for ease in rigging up. Orifices in all jets may be changed to correspond to pump liners without dismantling the jets.

The contractor is now installing a Thyrite generator and a 4 by 6-in. power pump on the compound, to be driven from No. 1 engine shaft. In addition to the dog house at derrick floor level, a dressing room for the drilling crew is installed on the 10-ft. derrick substructure. Power units are mounted on 4-ft. substructures, and all pipe is kept off the ground on 4-ft. unitized metal racks. The derrick man is provided with a monkey board and a power-operated drill-pipe mule.

Installation of many of these refinements on unitized sections of the rig will allow greater speed in rigging up and tearing down. Although considerable time was taken in the rig's initial installation, it is believed that the heavy elements of the rig can be placed in operating position in 2 days, using only the regular drilling crews in rigging up.

Above: This view shows self contained Oilwell No. 96 draw works and control and instrument panels on the derrick floor. All drilling operations can be controlled from the driller's position

Left: Taken from the derrick floor, this view shows two of the three prime movers, and the compound drive. Three compressors, mounted individually on the three engines, furnish air pressure for the dual-type reservoir mounted on the compound

Desulfurization and Superfractionation Make Products of Higher Octane Number

by T. W. Legatski and H. R. Legatski†*

ABSTRACT

Superfractionation is the refinement of conventional fractionation to produce higher quality and more uniform cuts of raw materials such as natural gasoline. Advances in petro-chemistry may improve the demand for such special products. The presence of sulfur compounds, especially hydrogen sulfide and mercaptans, in gasoline impair octane number of the clear product as well as reduce TEL susceptibility, so sulfur removal is a highly desirable and economical procedure.

This article was presented as a paper at the Dallas meeting of the Natural Gasoline Association of America, April 18-19.

AMONG the several recent advances in petroleum technology, the prewar development of what has come to be known as the process of superfractionation, although now widely practiced, has never been reviewed in detail in the published literature. On the basis that, with the exception of certain specific details, the process is an elaboration on an old established art within the industry, one might dismiss the subject from consideration with the verdict that there is nothing new in superfractionation. However, this process during World War 2 was responsible for a major share of the greatly expanded aviation-gasoline production and, as such should be recognized along with the other now familiar processes of alkylation, catalytic cracking, isomerization and blending. Collectively, these processes served to increase the high-octane aviation-fuel supplies by 10-fold in an unbelievably short period of time. Although superfractionation was being applied in at least one instance as early as 1928 and although it had been largely perfected in its many present applications by 10 years later, it was not generally adopted in the industry as a refining tool to augment aviation gasoline production until after the beginning of World War 2.

*Assistant director of research, and †process engineer, gasoline department, Phillips Petroleum Co.

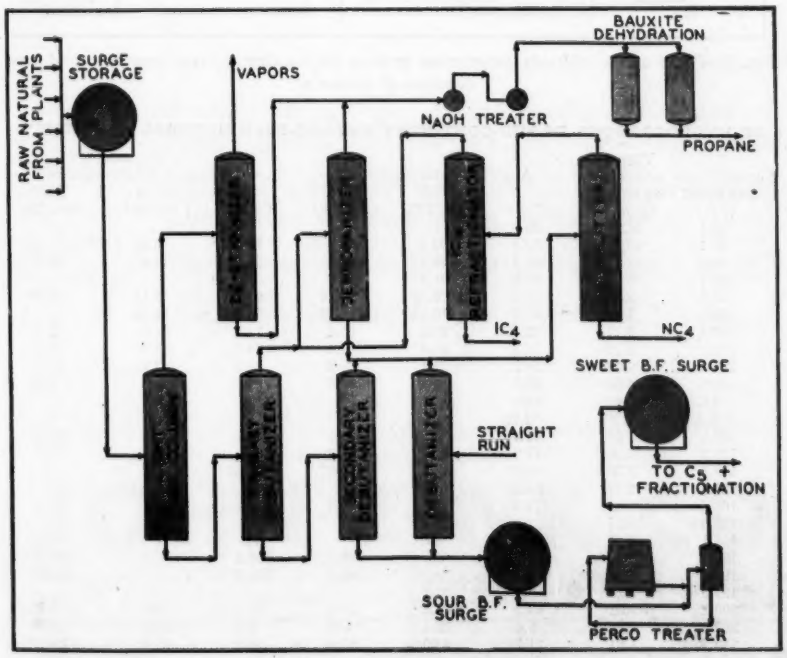


Fig. 1—Flow chart of raw-gasoline storage and light-ends fractionation system

Properties of Hydrocarbons and Various Natural-Gasoline Fractions

Before proceeding with a discussion of the methods of superfractionation as potentially applicable to natural gasoline, it will be desirable to first review briefly the distillation characteristics and antiknock properties of the major components and commercial cut fractions of debutanized natural gasoline. Table 1 lists some of these properties and compares them with those of the parent debutanized gasolines.

With respect to the parent natural gasolines, the marked effect of sulfur content on the clear and leaded octane numbers is an important observation that is now quite generally appreciated. Most Mid-Continent naturals contain sulfur in quantities varying from 0.005 to 0.025 per cent by weight or more. On the addition of 3 cc. TEL, debutanized naturals containing these amounts of sulfur would show a difference in A.S.T.M. octane number of 10 or more units. It is obvious, therefore, that sulfur reduction or sulfur removal should be considered an important step in the production of any fractions intended for use in ethylized fuels. Table 1 also affords a general idea of the characteristics and quality of the hydrocarbon fractions obtained from natural gasoline by a superfractionation operation and with concomitant sulfur reduction. We refer to a "nominal" fraction in this case as that fraction which embraces the normal boiling point of the hydrocarbon named. For instance, normal heptane boils at 209.2° F. and would obviously be contained in the nominal commercial fraction having a boiling range of 206° to 210° F. Although classed as "normal heptane," the clear A.S.T.M. octane number of 43.0 for this material immediately indicates that it is not normal heptane of any appreciable purity.

Although a great deal of antiknock testing by the 1-C and 3-C aviation methods has been done on those particular fractions used in aviation blending, practically no results are available on the parent naturals or on the nominal normal hydrocarbon fractions by these test methods. A

TABLE 1—SOME REPRESENTATIVE PROPERTIES OF MID-CONTINENT BUTANE-FREE NATURAL GASOLINE AND ITS FRACTIONS

Nominal fraction—	R.V.P.	Engler boiling range, °F. I.B.P.	50%	E.P.	Sulfur content wt. %	A.S.T.M. Clear	A.S.T.M. 3 cc. TEL	1-C Clear	1-C 3 cc. TEL	3-C 4 cc. TEL rich
Butane-free natural	12	...	...	...	0.025	63.9	77.5	...	...	...
Butane-free natural	12	...	...	...	0.015	65.0	82.5	...	...	...
Butane-free natural	12	...	...	...	0.005	66.3	88.0	...	...	...
Isopentane	20.0	79	82	89	0.0035	88.2	*0.58	88.2	*0.94	...
Normal pentane	14.6	93	97	102	0.0025	64.5	85.9	...	...	...
Isohexanes	7.4	133	138	142	0.012	79.4	96.6	78.5	98.2	‡99.0
Normal hexane	4.9	153	156	156	0.003	47.1	74.0	...	†75.0	...
Isoheptanes	3.2	175	178	190	.009	74.0	89.0	72.0	88.3	‡99.0
Normal heptane	1.7	206	209	210	.003	43.0	66.0	...	...	...
Isooctanes	1.5	212	...	234	.008	66.9	†84.9	67.8	84.0	‡93.5
Heavier	0.5	250	...	400	....	...	...	...	...	...

*Ce.'s TEL in primary isooctane. †With 4cc. TEL. ‡Per cent S in M.

general comparison of antiknock values may be obtained from the more plentiful A.S.T.M. antiknock test data. From an examination of these data we can immediately conclude that when using a debutanized natural of less than 0.005 per cent sulfur, fractions will be obtained of which only the isopentane, isohexanes, and isoheptanes will exhibit higher 3 cc. leaded octane number values than the parent material. All other fractions will have lower leaded octane values than those of the parent material.

On the other hand, when starting with a stock containing 0.025 per cent or more of sulfur, the benefit to be derived from sulfur removal is appreciable and a combined treating and superfractionation operation can yield fractions of which only the normal hexane, normal heptane and the "heavier than octanes" residue will have 3 cc. leaded A.S.T.M. octane numbers that are lower than those of the parent stock. These comparisons should suffice to indicate the advantages of sulfur removal operations.

The A.S.T.M. distillation data of Table 1 for characteristic fractions show that, with the sole exception of the "isooctanes and heavier" fraction, all are of about 10° to 15° F. boiling range. As will be noted from Table 2, within these narrow boiling-range limits we still have rather complex mixtures. From available analyses of various Mid-Continent

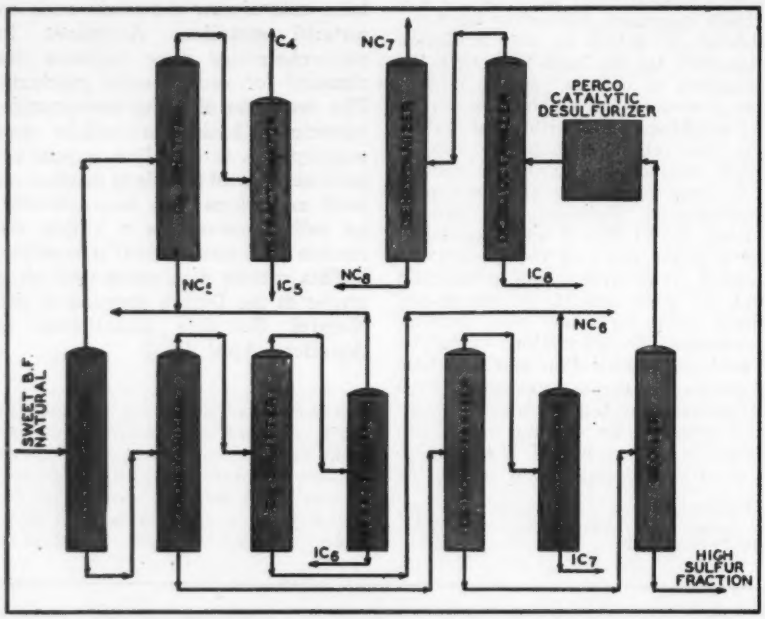


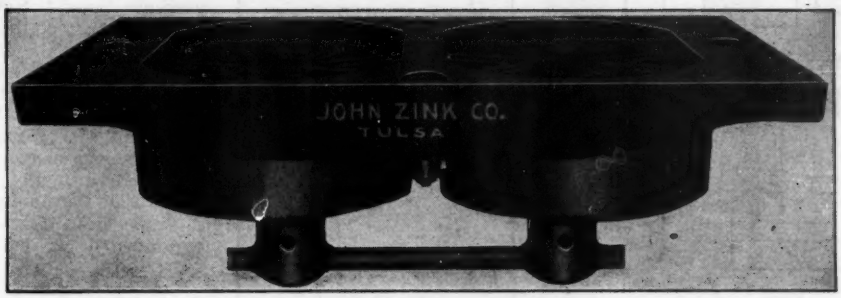
Fig. 2—Perco cupric chloride sweetening system for treating natural gasoline, and fractionation of products

TABLE 2—OCCURRENCE AND PROPERTIES OF HYDROCARBONS IN MID-CONTINENT BUTANE-FREE NATURAL GASOLINE*

Component—	Percentage in Mid-Cont. B.F. nat. gasoline	Normal boiling point (°F.)	Vapor pressure at 100° F. (psia.)	A.S.T.M. octane number Clear	A.S.T.M. With 1 cc. TEL	A.S.T.M. With 3 cc. TEL	Research octane number Clear	Research With 1 cc. TEL	Research With 3 cc. TEL
Neopentane	0	49.1	36.65	83.0	....	....	....	....	....
Isopentane	15-30	82.1	20.44	90.3	100.0	....	92.3	*0.37	*1.00
n-Pentane	20-30	96.9	15.57	61.9	77.1	86.6	61.7	74.9	88.7
Cyclopentane	0.5-1.5	120.7	9.91	85.0	91.4	95.2	...	...	...
2,2-Dimethylbutane	0.3-0.6	121.5	9.86	93.4	*0.58	*2.10	91.8	*0.15	*0.59
2,3-Dimethylbutane	0.1-0.3	136.4	7.40	94.3	*0.42	*1.79	*0.32	*2.15	...
2-Methylpentane	6-9	140.5	6.77	73.5	87.3	91.1	73.4	84.6	93.1
3-Methylpentane	3-5	145.7	6.10	74.3	87.5	91.3	74.5	85.0	93.4
n-Hexane	8-10	155.7	4.96	26.0	51.1	65.2	24.8	43.4	65.5
Methylcyclopentane	2-4	161.3	4.50	80.0	89.4	93.0	91.3	99.5	0.50
2,2-Dimethylpentane	0.1-0.3	174.6	3.49	93.0	...	...	...	...	...
Benzene	0.2-0.5	176.2	3.30	*2.75	...	...	...	...	...
2,4-Dimethylpentane	0.1-0.3	176.9	3.29	83.8	93.6	99.1	83.1	93.7	96.6
Cyclohexane	2-4	177.3	3.26	77.2	85.4	87.3	83.0	92.9	97.4
2,2,3-Trimethylbutane	....	177.6	3.28	*0.07	...	*3.07	*1.83	...	...
3,3-Dimethylpentane	....	186.9	2.77	84.0	...	...	...	...	...
1,1-Dimethylcyclopentane	0.2-0.5	189.5	....	†76.9	...	†88.7	†84.2	...	†95.9
2,3-Dimethylpentane	0.2-0.5	193.6	2.35	...	...	...	...	...	...
2-Methylhexane	2-3	194.1	2.27	45.0	...	...	...	...	...
1,3-Dimethylcyclopentane (Trans)	....	195.3	....	†76.9	....	†88.7	†84.2	....	†95.9
1,2-Dimethylcyclopentane (Trans)	....	197.4	....	†76.9	...	†88.7	†84.2	...	†95.9
3-Methylhexane	3-4	197.5	2.12	...	...	...	...	...	...
3-Ethylpentane	....	200.2	2.01	69.3	81.2	88.0	65.0	75.2	85.0
n-Heptane	2-3	209.2	1.62	0.0	25.4	46.9	0.0	10.6	43.5
Methylcyclohexane	1-2	213.7	1.61	71.1	82.0	86.2	74.8	83.5	88.2
Heaviers	4-7	....	....	...	...	...	...	...	...

*Ce. TEL in primary isooctane. †Values are for mixed dimethylcyclopentanes.

JOHN ZINK BURNERS



Vertical Type

JOHN ZINK BI-MIX BURNERS

Can't be beat for Gasoline Plant Boilers—practically all of the stationary oil field boilers in gasoline plants in The Mid-Continent area are fired with JOHN ZINK BURNERS.

●

— FEATURES —

Inexpensive to buy — easy to install. All in one piece.

Burns with a short flame, without the use of small ports, refinery gases, natural gas, oil vapors or a mixture of gases.

Slugs of water, oil or gasoline blow through them or run down over them without doing damage.

Can be used with high or low pressure gas.

Available for vertical or horizontal firing.

●

Write for descriptive literature.

JOHN ZINK COMPANY

TULSA 1, OKLAHOMA

NEW YORK • • • DETROIT • • • SALT LAKE CITY • • • HOUSTON

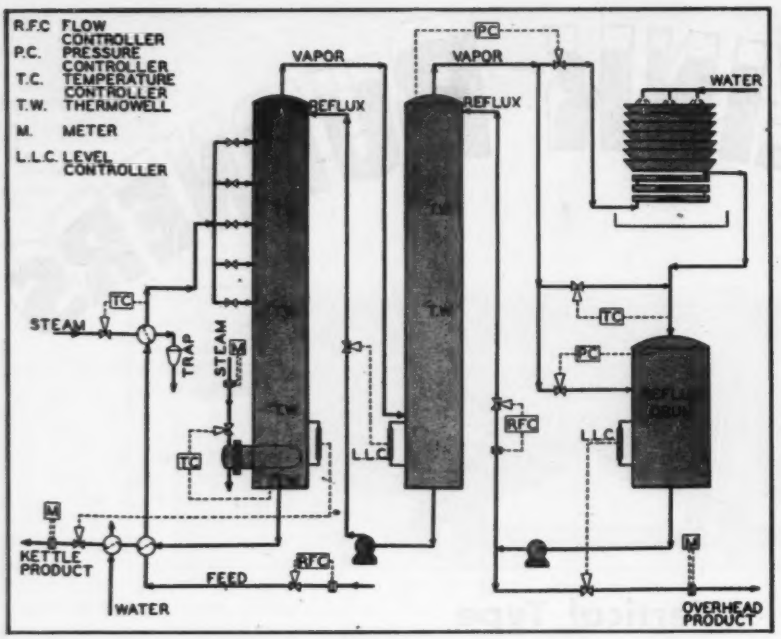


Fig. 3—Typical single fractionator unit. Towers containing 75 to 100 trays usually are installed in two sections, to avoid extreme height

gasolines, there is indicated the probable range of concentrations in which some of the individual hydrocarbons may be expected to occur. For instance, the fraction boiling between normal pentane and normal hexane, which is nominally classed as "isohexanes," can be expected to contain percentages of cyclopentane, 2,2-dimethylbutane (neohexane), 2,3-dimethylbutane (diisopropyl), 2-methylpentane and 3-methylpentane with the latter two hydrocarbons predominating. Likewise, the fraction boiling between normal hexane and normal heptane is by no means a simple mixture but can be expected to contain some of each of the branched chain heptanes as well as methylcyclopentanes, cyclohexane and benzene. The hydrocarbon compounds of the nominal isoheptanes fraction and the compounds in the mixture boiling above normal heptane have hardly been analyzed sufficiently to warrant assigning to them representative concentration percentages.

It should be apparent from the complex and variable makeup of the isofractions that no simple rule is possible with respect to the proper number of fractionating trays and the proper reflux ratio to be used in any specific separation. Design methods for the determination of required trays and proper reflux ratio are well known and can be applied to any particular set of data. Using the normal pentane - isohexanes separation as an example, the answers would vary widely depending upon how much of the cyclopentane and 2,2-dimethylbutane and how little of the normal pentane it was desired to retain in the isohexanes fraction.

We have pointed out the deleterious effect of sulfur content on octane numbers of unleaded and particularly of leaded stocks and have indicated the desirability of sulfur removal. Although available analytical data indicate that sulfur exists in debutanized gasolines in various forms such as mercaptans, sulfides, disulfides, and thiophenes, we are mainly concerned with mercaptans when preparing fuel fractions in the pentane to octane boiling range. From the boiling points of the lower molecular weight mercaptans as shown in

TABLE 3—BOILING POINTS OF ORGANIC SULFUR COMPOUNDS[4]

	Mercaptan (°F.)	Sulfide (°F.)	Disulfide (°F.)
Methyl	46	100	243
Ethyl	94	198	308
Isopropyl	140	249	...
n-Propyl	154	286	377
Isobutyl	190	343	...
n-Butyl	208	360	...
Isoamyl	246	...	482
n-Amyl	259	...	...

Table 3, it can be seen that their presence would contaminate all of the fractions boiling below octane. By the use of the familiar operation of sweetening natural gasoline, mercaptans are converted to disulfides boiling at least 200° F. above the corresponding mercaptans. Subsequently, the sulfur can be effectively concentrated into the fraction boiling above 200° F. and then eliminated by catalytic desulfurization or reduced by thermal or catalytic reforming operations.

Typical Superfractionation Applicable to Natural Gasoline

Before attempting to discuss the details of the individual superfractionator setup and its operation and control features, we shall first outline the general arrangement and the flow of raw material in a complete fractionation and treating installation. Fig. 1 is a flow sheet showing the raw gasoline receiving tankage and the "light ends" fractionation equipment. In any installation where natural gasoline condensate of varying composition is received for processing, it is essential that the fluctuations in composition be eliminated if uniform fractionator control is to be achieved. To this end, we have indicated the use of ample surge tankage fitted with mixing equipment. The suggested light ends frac-

Fig. 4—Typical superfractionator unit

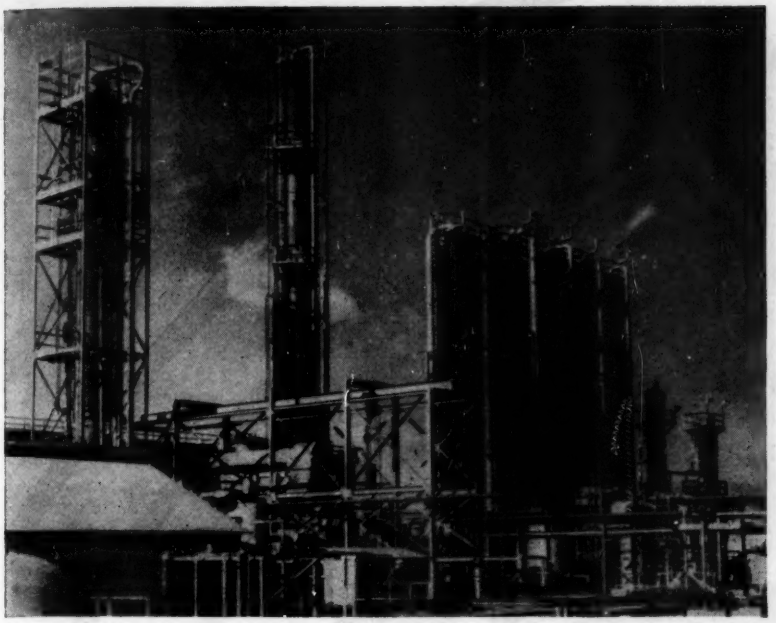


Fig. 5—Another representative superfractionator for producing special cuts from natural gasoline

tionation system which follows is probably conventional except for the method of debutanization and butanes splitting. With a variable demand for isobutane, a need for high-purity normal butane for special purposes and a less exacting demand for butane in motor-fuel blending, the use of a primary and a secondary debutanizer is an advantage. With such an arrangement, only the butanes from the primary debutanizer are fed to the splitter at times of low isobutane demand. This particular butanes fraction has the higher isobutane concentration and the lesser pentane contamination so it produces the high-grade normal butane for specialty purposes along with the required isobutane. During such operation, the butanes from the secondary debutanizer, containing some isobutane and some pentanes can be diverted to motor-fuel blending. Whenever maximum isobutane production is required, the butanes from both primary and secondary debutanizers must of course be sent to the splitter.

For the production of high-purity isobutane, and in fact of almost any other hydrocarbon or fraction, the use of a refractionator is an aid to operation and product control. While it is difficult with even a uniform feed volume and composition on a large operation to effect simultaneously complete depropanization, high isobutane recovery, and propane specification control, it is relatively easy to produce maximum isobutane with some propane contamination and then to refractionate for quantitative propane removal.

The propane, isobutane, and normal butane produced from a system such as the one described may be variously treated with caustic or doctor solution for simple sweetening or for sulfur reduction, depending on the contemplated use. Propane for bottled gas purposes must, of course, be dried either by a further fractionation step or through use of appropriate dehydrating agents.

The sour debutanized effluent from the "light ends" fractionation system is next passed through surge tankage and thence to the Perco cupric chloride sweetening operation, as shown in Fig. 2, where mercaptans are converted to the higher boiling disulfides. The subsequent operations of depentanization and dehexanization yield sweet overhead products from which most of the sulfur has been fractionated. After splitting the pentanes and hexanes fractions, the overhead products are passed to refractionators for removal of the last traces of normal butane and normal pentane respectively.

As shown in Fig. 2, the kettle product of the dehexanizer is next fractionated for isoheptanes' production and the isoheptane so produced is recut for light ends removal. In the case of the isoheptane product, although most of the sulfur is eliminated by the fractionation, the high temperature employed generally causes some slight decomposition of high-boiling sulfur compounds. As a consequence, this material must generally be caustic washed and resweetened to remove the traces of hydrogen sulfide and to reconvert the mercaptans.

Production of a satisfactory, low-sulfur-content isooctanes fraction by direct fractionation from the normal heptane-and-heavier stream is difficult[9] when the sulfur content of the original natural gasoline is appreciable. Even a small quantity of mercaptan sulfur in the original debutanized feed stock, when converted to disulfides and concentrated in the natural fraction boiling above 200° F., will result in a low-quality blending material. For such cases, a 200° to 250° F. fraction may be separated by "deoiling," may be then catalytically desulfurized and finally fractionated to yield a low-sulfur isooctanes fraction. The heavy residual material obtained in the so-called deoiling operation, consisting mostly of absorption oil and containing a large part of the original sulfur content of the gasoline, is of small volume and presents no serious disposal problem.

A representative single superfractionator unit is outlined in principle in Fig. 3. Since the incorporation of

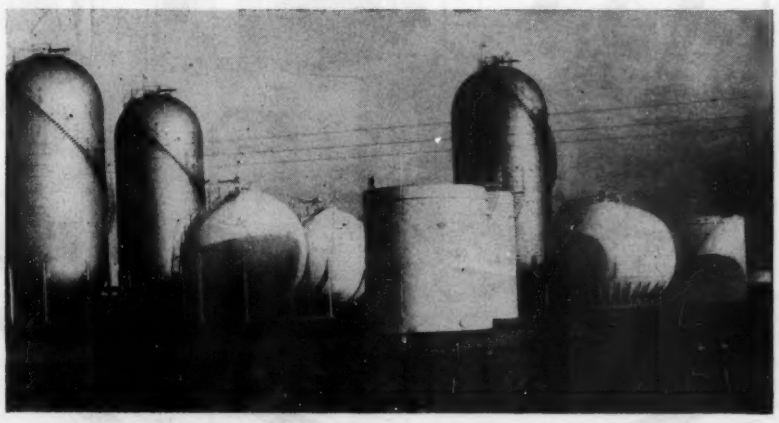
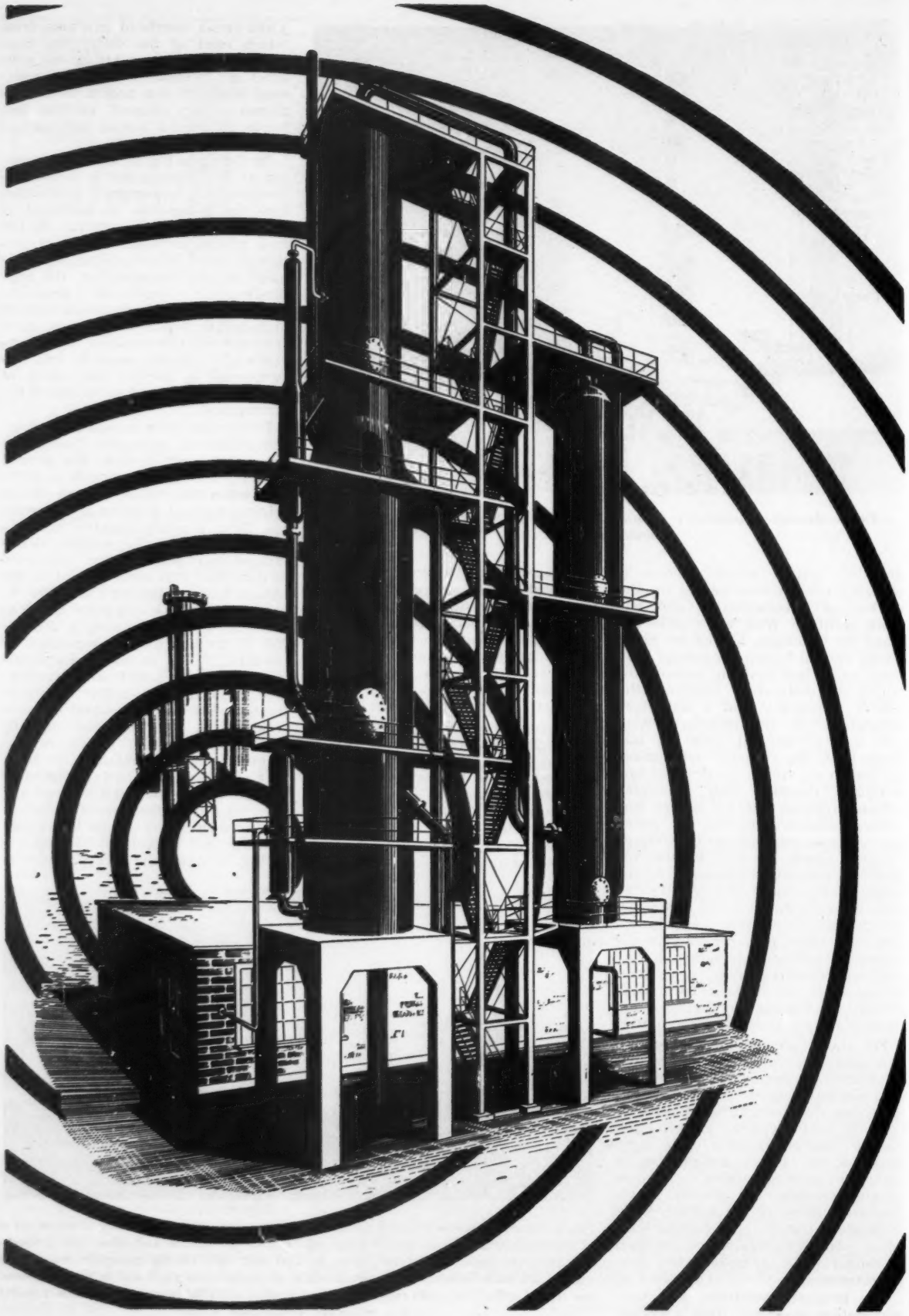


Fig. 6—Natural-gasoline fractions of varying vapor pressures require many different types of storage facilities. Here we have the tall "bullets" for butane and other light products. The spherical tanks are Hortonspheres for LPG and very volatile materials; toward the right is the well-braced Hortonspheroid, while on the extreme right and in the foreground are typical cylindrical tanks such as may use floating roofs for storing less volatile gasoline with minimized evaporation losses



75 to 100 trays in a single large column section presents problems of fabrication, transportation, and erection, it is common practice to install a single fractionator as two column sections in series as illustrated. For satisfactory operation on a wide variety of separation problems, equipment is provided for the maximum control of all variables which might conceivably affect the efficiency of the separation unit.

Feed stock, of as uniform a composition as obtainable, is pumped to the fractionator at a controlled uniform rate. The feed is heated to the proper temperature by means of heat exchangers and a preheater. Although not absolutely necessary, it is advisable to operate the preheater on a control actuated by the temperature of the feed entering the column. The point of feed entry is, of course, determined by the desired separation and a sufficient number of entry connections are necessary to permit selection of the optimum point.

Steam to the heating element for reboiling is always metered and the required quantity is usually controlled by a suitable motor valve actuated by the temperature in the base of the column or, in some cases, by the temperature at some point higher in the column. To accommodate various operations, thermowells should be provided at various points above the kettle so that the optimum control bulb location can be readily ascertained. In some instances, the steam to the kettle element is controlled by a temperature point located in the top half of the fractionator.

Column pressure is controlled by a motor valve in the overhead vapor line ahead of the reflux condenser. Since the pressure drop through the fractionator may be as much as 10 to 15 lb. and since it is variable with column loading, one has the choice of controlling either top or bottom column pressure. To eliminate troublesome pressure surges, it is generally preferable to control the pressure at the bottom of the column.

Overhead vapor is condensed and slightly cooled using either shell-and-tube condensers or coil sections in a spray tower. To provide a reflux at a constant temperature, hot vapor is bypassed from the overhead vapor line ahead of the pressure control valve and is injected into the condenser rundown line. With this arrangement and a controlled rate of reflux flow, the internal reflux and the column internal temperatures can be held uniform. Vapor is also frequently bypassed from the high pressure side of the column pressure controller directly to the vapor space of the reflux accumulator for pressure maintenance in the event of sudden cooling of the uninsulated tank top by rainfall. This general type of reflux pressure and temperature - control system is considered essential to steady satisfactory operation.[3] In those cases where induced draft cooling towers are used for overhead vapor condensation, it is sometimes even practical to employ steam turbine driven fans with the speed controlled by the reflux accumulator liquid temperature to compensate for variable atmospheric temperature.

Conclusion

From this general description it can be readily seen that the superfractionation technique is a refinement in method and apparatus over the old conventional separation practices, a refinement brought about through the need for closer control in more difficult separations. How widely and to what extent the new techniques can be applied to natural gasoline production are unanswered questions. Also unanswered are questions as to how these new potential products, either mixtures or the pure hydrocarbons themselves can be utilized. With the rapid advances that have been made in the field of petrochemistry, and with the many war-born developments in the field of higher-quality fuels, it would indeed be strange if the products of the new superfractionation art were unable to find markets ultimately in one or the other of these fields.

Bibliography

1. A.P.I. Hydrocarbon Research Project.
2. Sulfur Compounds in Petroleum and Its Distillates, by Harold Bottomley, The Oil and Gas Journal, October 23, 1941.
3. U.S.P. 2,369,058, February 6, 1945.

How to Avoid Injuries From Gas Engines

by Henry W. Boggess*

OIL-FIELD gas engines yearly reap a great toll of serious injuries and deaths. Despite this fact, few workmen, and least of all those who work with it, consider the gas engine a dangerous instrument. Like fire, the oil-field gas engine is necessary and it is relatively harmless when understood and properly controlled.

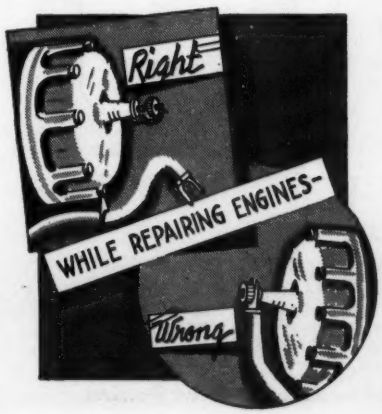
Gas-engine injuries and deaths occur from two principal causes:

1. Kick-backs while tramping flywheels.

2. Failure to render the ignition system inoperative before working on an engine.

It may be argued that the tramping of flywheels should be eliminated by the installation of air or mechanical starting devices. As yet, this is not a practical solution for some types of gas engines in use on isolated properties and particularly on marginal properties where lifting costs demand every economy. Rather, the solution lies in understanding and uniformly following known routines and practices that will insure safety. Every pumper should know:

*Superintendent of personnel department, Sinclair Prairie Oil Co.



(a). A proper mixture of gas and air will explode when ignited, regardless of the conditions which surround the mixture, therefore, an explosion is bound to occur in the combustion chamber of a gas engine if the mixture is right and spark hot enough.

(b). Gas engines should be marked on the flywheel so that dead center can be easily determined and the engine should be so timed that the ignition point for starting will be from 4° to 6° past dead center. Under these conditions, a gas engine will not kick.

(c). Excessive pressure between the gas regulator and the mixing chamber makes any engine hard to start and no operator should needlessly tire himself trying to start an engine before being sure that his fuel mixture and his spark are right.

(d). Under no circumstances should any work be done on an engine without removing the spark-plug wire and securing it so that it cannot make contact with the plug.

(e). In timing, the plug should be removed to relieve compression.

(f). Flywheel spokes should be tramped with the ball of the foot so that the foot will slip off outwardly in the event of a kick-back.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Simplified Flow Diagrams Furnace Black Process

Do you have any information regarding the manufacture of carbon black from oil such as is done in the "Philblack" process? Flow diagrams, feedstock composition, and quality.—L.S.K.

Little has been published on the mechanical details of the carbon-black processes and this is unfortunate because the success of such a process is vitally dependent on such details, particularly the mechanism of forming the flame cloud in which the carbon atoms are liberated. Processes such as the Philblack process should be examined through the patent literature. It is a continuous-combustion furnace-type process which may employ oil along with gas, as a feedstock. The black from the process is said to be a smooth processing black which produces a high modulus (stress at a given elongation) rubber, and it causes relatively little shrinkage when compounded with rubber. The War Production Board classifies Philblack A as High Modulus Furnace (H.M.F.) black (Cohan, L. H., Carbon Black in War and Peace, Chem. & Engineering News, Page 2078, Vol. 23, No. 22, Nov. 25, 1945) with properties as follows:

Average partial diameter, $m\mu$	50-60
Surface area, sq. m. per gm.	60-50
Surface nature chiefly carbon and hydrogen	
pH of a sludge of black in water	10
State of aggregation in rubber	high
Relative tinting strength	medium

Such a black is generally intermediate between channel blacks and thermal blacks in particle size and surface area; the channel blacks being small in diameter and presenting a great surface area. In general, the oil-gas furnace blacks partake somewhat of the properties of lamp-blacks which are produced totally from oil.

Little can be said of the usefulness of a carbon black without considering the exact use to which it will be put. With respect to synthetic rubber (buna S)) the H.M.F. black is superior to the standard semireinforcing furnace black (S.R.F.) in wear resistance and hence can be used for heavy-duty service as in truck treads. H.M.F. is also processed with great ease, being superior to even E.P.C. (Easy Processing Channel) black, and it exhibits great resistance to heat development and flex cracking. Each type of black, however, has its own field of application and hence it should not be inferred from the above that H.M.F. is the best carbon black. Undoubtedly the channel blacks are best for most natural rubber applications.

Details of the Philblack process are not available (Gallie, J. F., Carbon Black, Pet. Refiner, page 97, March 1944) but it is generally similar to the furnace process discussed and shown on this page. The yield is said to be about 60 per cent as compared with a 3 per cent recovery by the channel process. Thus with 50 lb. of natural gas (about 1,000 cu. ft.) the yield of channel black is under 1.3 lb. whereas with 50 lb. of oil and gas processed by the Philblack process the yield might be 26 lb.

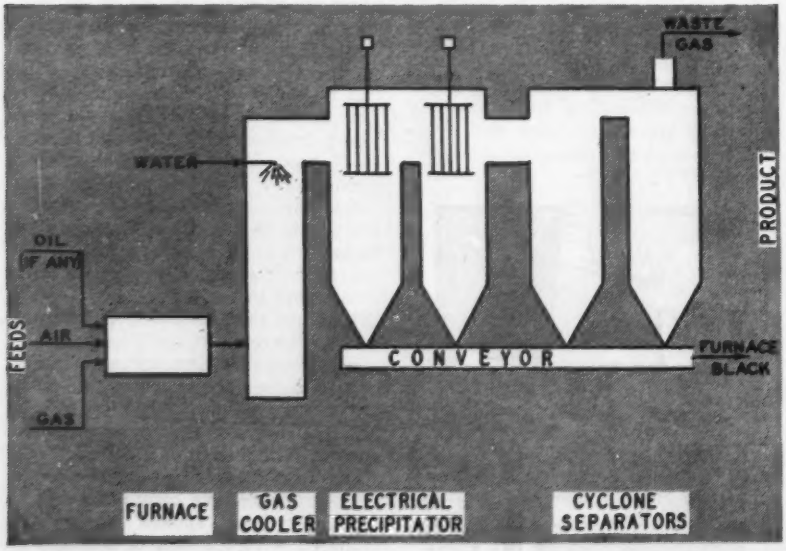


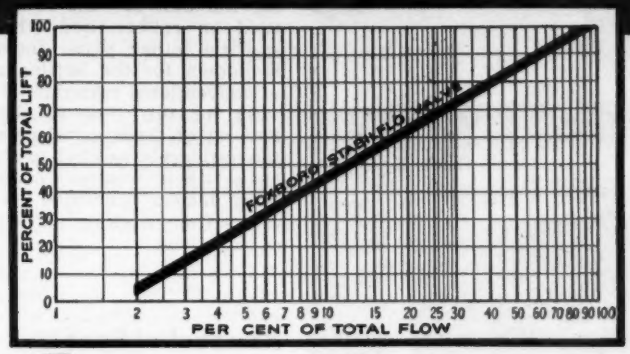
Fig. 1—Simplified flow diagram of furnace (combustion) black processes

Furnace Process

The furnace processes involve burning gas, oil, or mixtures of them with insufficient air for complete combustion (often half of theoretical air required for complete combustion). The soot is sprayed with water and the particles of black may be precipitated by Cottrell electrical precipitators and cyclone separators as indicated in the diagram on this page. Oil must be finely atomized at it is sprayed into the combustion zone. Furnace temperatures range from 2,200°-3,000° F. and the products of combustion are cooled to about 500° F. by means of the water sprays. Numerous oils have been used or recommended, such as wild gasoline, tank bottoms, kerosene, gas oil, topped crude oil, creosote, fuel oil, benzol, pine-tar oil, etc. A somewhat different problem of atomization is presented with each of the materials particularly with the viscous materials. Based on natural gas the yields by the furnace process range from 6 to 16 lb. per 1,000 cu. ft. The black is pelleted but the pellets are so soft that furnace black is usually shipped in bags.

A complete discussion of the general properties of furnace blacks is given by Mattiello's book entitled, "Protective and Decorative Coatings," Vol. II, John Wiley & Sons, N. Y., 1942, in the chapter entitled, "Furnace Blacks or Low Oil-Absorption Lamp-blacks." Extensive quotations from this reference were published on the Questions on Technology page of March 11, 1943, page 62.

Only Stabilflo Valves will give you this remarkable performance

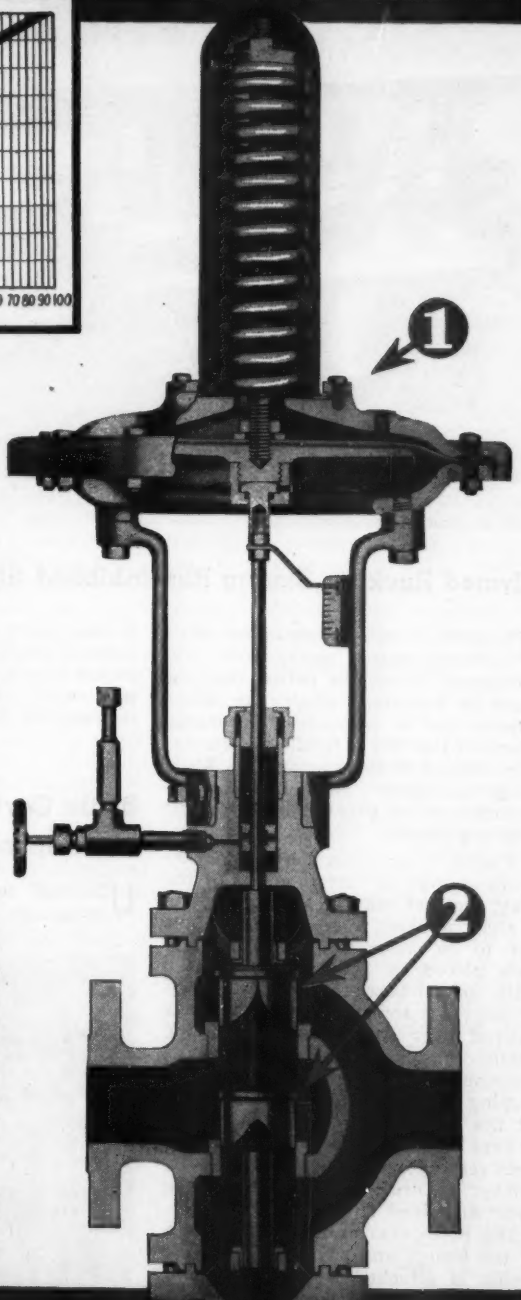


50 to 1 RANGEABILITY WITH UNIFORM CHARACTERISTICS

With this unique valve, you now can be sure that the extraordinary sensitivity, accuracy, and dependability of precision-engineered controllers are translated into matching valve performance.

The unique characteristics of the Foxboro Stabilflo Control Valve are graphically revealed in the chart above; . . . *equal increments in controller output (and valve lift) produce equal percentage changes in flow.* Thus under constant pressure drop conditions and on a semi-logarithmic scale, the line plotted is straight.

This achievement was made possible by two major Foxboro developments in valve design. . . .



1 THE INVERTED TYPE MOTOR... By reversing the usual position of diaphragm and spring, Foxboro engineers practically eliminate all sources of friction in the action of the motor. Anti-friction bearings are unnecessary. The suspended construction of the valve motor requires no guides. A special flexible coupling between the valve stem and the diaphragm motor allows the stem to establish normal alignment.

This self-aligning motor with its floating action is an exclusive feature of Foxboro Stabilflo Valves.

2 WIDE RANGE V-PORT VALVES... This outstanding development corrects the common faults of control valves of conventional types. Almost any kind of port opening can produce equal percentage flow changes within a limited range, but Foxboro's WIDE RANGE V-PORT VALVE extends the limits to the full stroke of the motor. The greater the rangeability possessed by a valve, the greater its ability to handle unusual conditions. Hence, the 50 to 1 rangeability means that the Stabilflo Valve insures satisfactory control at all demands.

Since the success of any control system may depend as much on the performance of the valve as on the control instrument, it will pay you to investigate the advantages of Stabilflo Valves. Write for complete information. **The Foxboro Company, 60 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities.

FOXBORO
REG. U. S. PAT. OFF.

AUTOMATIC CONTROL VALVES

PLANT PRACTICES

Pivoted Rack for Storing Rust-Inhibited Steel Gaskets

TO protect metal gaskets for compressor-engine units from rust formation during the period they are kept in storeroom stock, the storekeeper for a pressure-maintenance plant in the Wertz field uses the device shown in the photograph. Made from salvaged materials and constructed in the plant, the rack's cost was negligible.

Placed in a recess between storeroom shelves so that it is out of the way, the rack may be swung out into a clear working space when gaskets are to be stored or removed. Gaskets placed on the rack are coated with an oil-base rust inhibitor and at intervals some of the inhibitor is poured over each stack. When the inhibitor is applied by flooding or pouring, the excess drains into a sloping trough and then into the sump at the trough's lower end where it is kept for the next flooding. The gaskets rest upon a length of 1 by 8-in. lumber in order to avoid injury to their machined surfaces.

The pivot arm extends full length of the trough and swings in a socket which is attached to the storeroom wall by four ⅝-in. bolts. Dimensions of the trough for this particular installation measure 1½ in. deep by 10-in. wide and the sump which usually contains about 2 gal. of inhibitor measures 12 by 12 by 12 in. The pipe nipples for keeping the gaskets in stacks are set into holes in the 1 by 8. Bearing for the 2½-in. pipe pivot arm is at the contacting areas of the elbow and the 3-in. pipe socket and a short length of 2½-in. pipe extends into the socket to make the vertical bearing for the rack.

Bottle Cart Built to Meet Special Needs

UNABLE to obtain a commercial type cart that would meet all of their particular needs the welding crew at one refinery designed the unit shown in the accompanying photograph. The unit is said to be easily handled by one man even when moved over soft earth and ample space is provided for the usual working tools employed by the acetylene-welding and cutting crew. Wheels for the unit are the same as those used on rubber-tired wheelbarrows and the other parts, including the holddown for the bottles, are made of conventional materials of standard sizes for this type of construction. Several of these carts were built in the refinery's weld shop during periods when weather conditions or other factors prevented the welding crews from working at their regular outside jobs.

Removal of Spent Catalyst Made Easy

THE time for removal of spent catalyst from the chambers of polymerization units in the Freedom refinery of Freedom-Valvoline Oil Co. has been reduced from several days to approximately 2 hours through the use of a special device designed by Ross McClain, master mechanic of this refinery, and built in the refinery shops. It is of welded construction, and consists of a tube knocker point, and three rows of lathe bits which can be adjusted by means of set screws. The assembly is welded to a shaft and is driven by means of an air motor. Two men operate the apparatus from the bottom of the tower, and the shaft is extended by means of couplings and 2-ft. sections of pipe until the entire bed is penetrated from bottom to top. This operation does not remove all of the catalyst but makes a hole large enough through the bed so that the remaining portion can be easily knocked off the walls.

Trends in

Processing Gas-Condensate Reservoirs

by Dr. F. H. Dotterweich and Dr. E. O. Bennett†*

The authors suggest a tentative method to better evaluate retrograde losses occurring in condensate reservoirs and suggest possible trends which may make available, to postwar industry, a greater quantity of the lighter hydrocarbon fractions, by effecting greater economies in the extraction of these fractions from nature's reservoirs. This article was presented as a paper at the N.G.A.A. meeting, Dallas, April 18-19.

DURING the past 10 years many areas have been discovered, particularly in the South Texas and Gulf Coast districts, in which the hydrocarbons, in most cases, exist entirely in the vapor phase in the formation, but when produced will partially condense upon reduction in pressure or temperature, or both. This phenomenon, termed retrograde condensation, is observed in the so-called gas-distillate or preferably gas-condensate fields. The phenomenon is now well known and generally understood and will not be discussed in detail.

As deeper drilling is conducted in the areas above mentioned, it is believed that proportionally more and more pools of the gas-condensate type will be discovered and the condensate-recovery phase of the industry will become correspondingly more important as time goes on.

"Cycling" was first inaugurated on a commercial scale about 1938, for the purpose of preventing precipitation and loss of liquids in gas reservoirs and for the prevention of waste of the byproduct gas. In natural-gas cycling the byproduct, or residue gas, is compressed and injected into the same reservoir from which it was produced to maintain pressure and to cause unprocessed or wet gas to be moved to producing wells for delivery to the recovery plants.

Lean Gases Present Economic Question

In the absence of a commercial gas market, natural-gas cycling was accepted, in many instances, regardless of the recoverable G.P.M. (gallons per thousand cubic feet) of the gas. In certain cases the low G.P.M. content of the gas processed by cycling methods may be questioned from a conservation viewpoint, when it is observed that modern petrochemical processes make possible the conversion of the lighter hydrocarbon gases into valuable liquid hydrocarbon fractions with surprising over-all conversion efficiencies, a discussion of which is given elsewhere in this paper.

As the cycling phase of the petroleum industry grew and progressed, and improved methods of long-distance transmission of natural gas brought additional gas markets to the nation's gas-condensate fields, many questions have arisen as to the economic feasibility of cycling low-G.P.M. gas-condensate reservoirs, in the absence of an effective water drive, to maintain pressures. Conservation-commission rules and regulations and the protection of correlative rights also complicate the problem.

In determining the effect of retrograde condensation in single-phase reservoirs, two methods of investigation under isothermal conditions (constant reservoir temperature) have been used. When the pressure on a hydrocarbon system is reduced by expanding the volume of the container, the term "flash" separation applies, and all the original components of the hydrocarbon systems are retained throughout the test. Should the pressure on such a system be reduced by withdrawing gas from a constant-volume container, the term "differential" separation applies. In both cases the amount of liquid produced is observed and reported on the conventional retrograde curves.

Two types of apparatus have been developed, in conducting retrograde-condensation tests, and both should give essentially the same results when properly operated, and when truly representative samples of reservoir fluid are available. Since development of the United States Bureau of Mines method, in which continuous sampling and analysis in the field is used, the authors believe this procedure well predicts actual reservoir conditions (laboratory samples supplement field analysis) as well as can be reflected from laboratory and field data. Recognition of the Bureau of Mines methods, and the excellent work of its personnel in connection with the cycling industry, is hereby accorded. Some of the work done by the bureau technicians has been studied, analyzed and used in this discussion.

It now appears desirable briefly to state the circumstances which led up to the development of the tentative method for predicting retrograde losses from gas analysis described and discussed in this paper.

Throughout the entire period of World War 2, the United States Bureau of Mines, at the request of Petroleum Administration for War, carried out a series of comprehensive studies of newly discovered gas-condensate fields in an effort to aid in expanding gas-cycling operations. This was for the purpose of increasing the quantities of liquid products obtainable, which are well known to be of great value in the production of synthetic rubber, aviation fuel, explosives, chemical raw materials, and other uses.

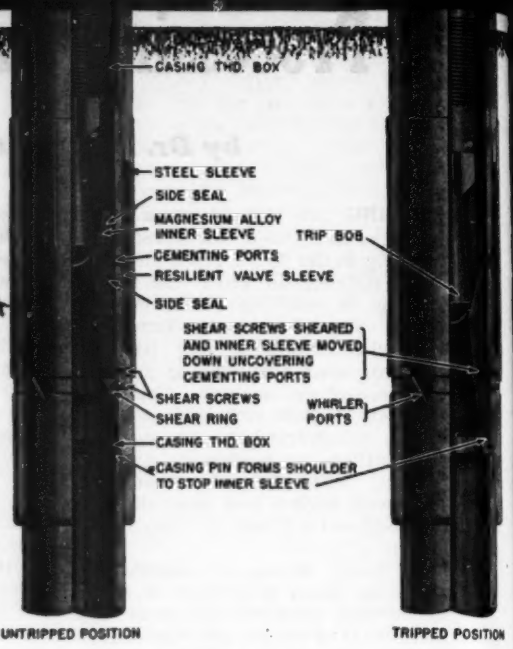
Retrograde Loss

These reports gave, in addition to many other valuable data, information relating to the retrograde loss in the reservoirs studied. Since this work was carried on with extreme accuracy, the physical properties of only seven reservoirs were reported in detail. In studying this information, Henry M. Brown, then director of the Natural Gas-Gasoline Division of PAW District 3, suggested that all of the available data be studied with the idea of developing some suitable graphic method of predicting retrograde losses in a gas-condensate reservoir, when the composition analysis of the reservoir fluid was known. With this in mind, using the data developed by the Bureau of Mines, study was given to the development of correlation curves. It was found, after extensive investigation, that a very smooth curve developed when the heptanes-plus fraction in G.P.M. was plotted against the loss of butanes plus, due to retrograde condensation, where no dry gas is returned to the reservoir. Several companies also furnished data and their personnel offered valuable suggestions in this work.

As above stated, the original curve developed from the Bureau of Mines data was very satisfactory and it is regretted that the Bureau of Mines cannot, at this time, remove the re-

*Texas College of Arts and Industries, Kingsville. †Engineering consultant, Houston.

BAKER MULTIPLEX Cementing Equipment Performs Efficiently and Economically

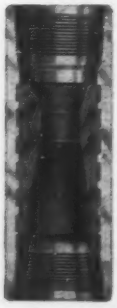


Developed for depositing a continuous encasement of cement around a blank string of casing at pre-determined intervals, to make sure that the cement completely fills the annulus, and that channeling is reduced to a minimum, BAKER Multiplex Equipment provides these important advantages . . .

- ✔ Eliminates auxiliary cementing string, special running-in or cementing tools.
- ✔ Variety of combination hook-ups to meet different well conditions and cementing problems.
- ✔ Use of Slidably Mounted Metal Petal Basket greatly increases probability of successful initial water shut-off.
- ✔ Adaptable to either plug or displacement cementing method for each stage of a multi-stage cementing job.
- ✔ Whirler port action distributes cement slurry evenly around casing; reduces channeling hazard.
- ✔ Sleeve-type, back-pressure valve prevents equalizing of cement following each stage.
- ✔ All internal mechanisms constructed of readily-drillable materials.

SIMPLE CONSTRUCTION—POSITIVE OPERATION

The specially designed Multiplex Collar with male and female threads, or double female threads as shown above, is provided with cementing ports and a resilient sleeve (reinforced with bias canvas) which acts as a back-pressure valve on the periphery of the collar and is protected by a steel sleeve around its exterior. A magnesium alloy inner sleeve, with a tapered hole through its center, covers the cementing ports and is held in place by shear screws until tripped. The mechanism is operated by a Trip Bob made from a hollow magnesium alloy casting, filled with lead to give it sufficient weight. This Trip Bob has a resilient seal on the lower end for sealing off in the seat of inner sleeve.

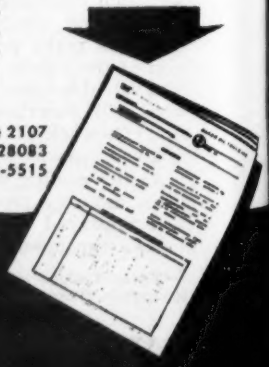


BAKER MULTIPLEX Plastic Baffle Collar (Product No. 374) consists of a steel collar and a plastic baffle with a passageway shaped to pass a Flexible Cementing Plug, and large enough to pass the Trip Bob. The Plastic Baffle Collar serves as a stop for the conventional cementing plug which is used to follow up the slurry when cementing through the uppermost Multiplex Cementing Collar. It is placed one or two joints above the collar to retain all mud-contaminated cement inside the casing.

BAKER FLEXIBLE Cementing Plug (Product No. 372) serves the same purpose as a standard top cementing plug, acting as a separator between the column of cement and the following column of fluid traveling down the casing. It is made wholly of rubber and will compress uniformly to a sufficiently small O.D. to pass through the inner sleeve of all Multiplex Cementing Collars while being pumped down the casing. It immediately regains its original shape without permitting any by-passing of fluid either up or down the hole.

Ask for This Bulletin

A new 8-page bulletin contains specifications on BAKER Multiplex Collars and auxiliary equipment. Illustrates and describes how to perform Two-Stage and Three-Stage Cementing jobs and contains other interesting data. Any oil man is welcome to a copy—ask for yours today.



BAKER OIL TOOLS, INC.

LOS ANGELES, Calif. . . . 6000 Boyle Ave.; Phone Jefferson 8211
HOUSTON, Texas . . 6023 Navigation Blvd.; Phone Wayside 2107
TULSA, Oklahoma . . . . . 312 East Fourth Street; Phone 28083
NEW YORK, N.Y. . . 19 Rector St. (Zone 6); Phone Digby 4-5515

stricted classification of this information, so that the work of Eilerts and his associates could be published and the curve given with all the supporting data. In developing the curves presented in this paper, the authors choose to call them tentative. Other data mentioned were used and since the curves are partly based on Bureau data, only the tentative curves, without complete supporting data, are given at this time. It is hoped that this work may be expanded with greater detail in the near future.

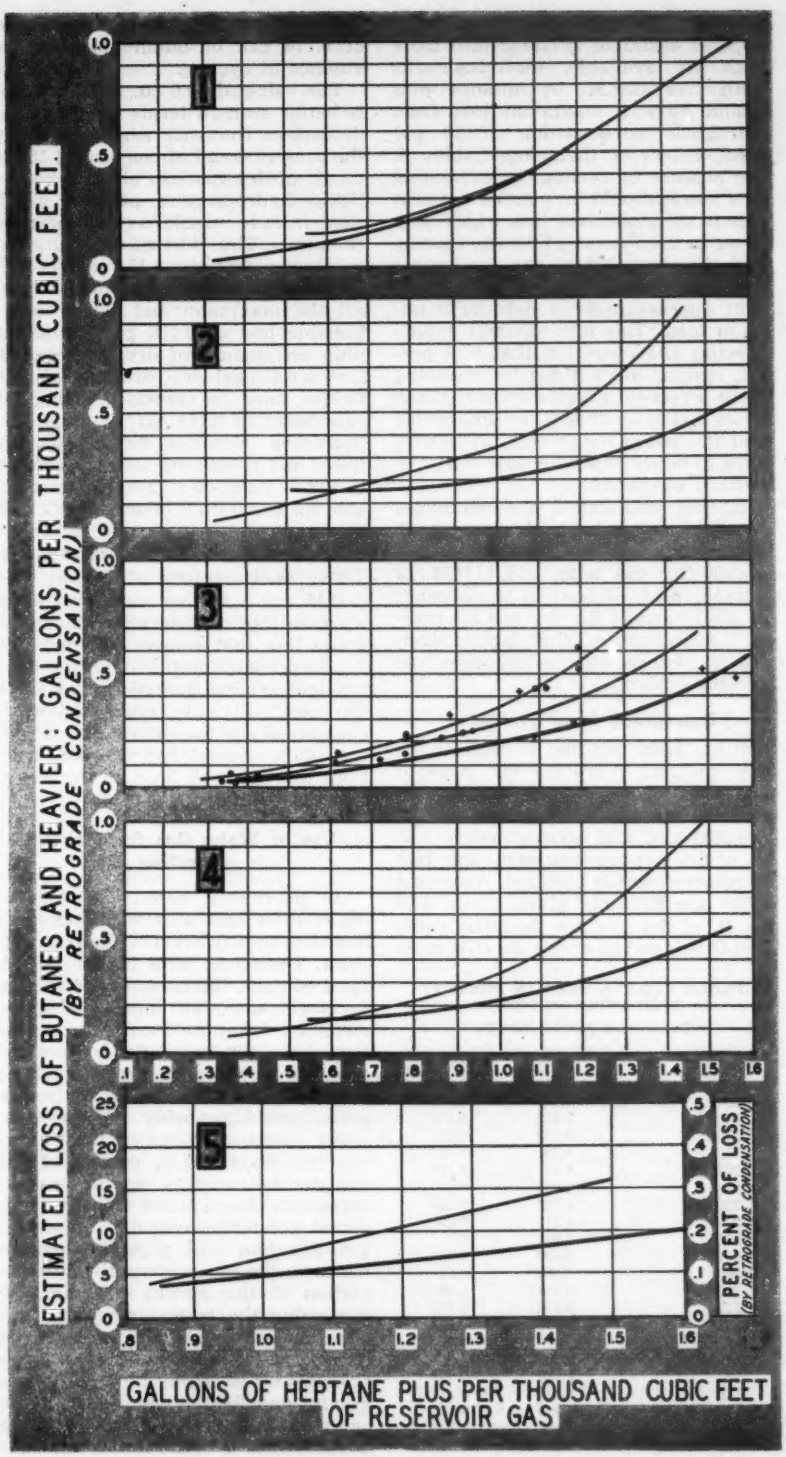
Fig. 1 gives the first curve developed. It will be observed that should the G.P.M. of heptanes plus be available from the analysis of the reservoir gas, the loss in G.P.M. of butanes plus may be estimated from the curve. It can be seen that with increased G.P.M. of heptanes-plus content in the reservoir, the loss increases until the slope of the curve is constant and a maximum from about 1.00 G.P.M. of heptanes plus and higher, when the temperature of the reservoir is not taken into consideration.

Two Curves Developed

In analyzing these data, it was suggested by a member of one company that two curves be developed, one for reservoirs having temperatures below 200° F., the other for those above 200° F. He observed a relationship which is reported in Fig. 2. It will be noted there is a tendency for the curves to cross when the content is about 0.650 G.P.M. of heptanes plus.

The authors have studied the data with attention being directed to reservoir temperature, and curves for reservoirs below 200° F., 200° to 250° F., and above 250° F. have been developed. These are shown on Fig. 3. At the present time sufficient reliable data are not available definitely to predict curves for all different temperature groups, but it is believed highly probable that as additional data are developed, the pattern as suggested will be confirmed. Study of the curves suggests that as reservoir temperature increases there is a decrease in the loss resulting from retrograde condensation. From this it may be anticipated that retrograde losses from deep structures will be less than for shallow ones. At present, the authors believe sufficient reliable data are available to draw the tentative curves for reservoir conditions above and below 200° F. and such tentative curves are set forth in Fig. 4. These curves will be used in developing the ideas set forth in this paper in discussing the advisability of cycling low content reservoirs where a market is available for the sale of gas.

A study of Fig. 4 indicates that in all reservoirs for fluids containing about 0.600 G.P.M. heptanes plus and less, the two curves coincide. With this in mind, well fluids indicating about 0.600 G.P.M. of heptanes plus were studied concerning the loss in per cent and loss in G.P.M. of butanes plus, when plotted against the G.P.M. of butanes plus in the reservoir fluid. Fig. 5 reflects this correlation and it will be noted that for well effluents containing about 1.18 G.P.M. of butanes plus, the retrograde loss is about 0.12 G.P.M. of butanes plus, or about 10 per cent. Since there are substantial data on reservoirs of this



Figs. 1-5—Tentative method for estimating maximum loss of liquid hydrocarbons in condensate reservoirs, when pressure is decreased by removal of gas phase, (no dry-gas return)

content, suggesting lower losses, it appears desirable to state, until more data are available, that reservoirs with 1.18 G.P.M. of butanes plus would have a maximum loss from retrograde condensation of 10 per cent or less of their liquefiables in the absence of cycling. In estimating this loss it should be pointed out that this is the maximum loss which may occur in the absence of revaporization, and the sweeping of any condensate into the well bore, thus the 10 per cent appears to be a definite maximum loss. This loss assumes a well spacing and operation that will permit moving all wet gas to producing wells. Practical experience over many years indicates this to be impossible and the above losses will necessarily have to be increased because of sweep pattern efficiency.

Having established the maximum possible and improbable loss at 10 per cent of butanes plus in the reservoir (for gas with 1.18 G.P.M. of butanes plus, or less) in the absence of the return of the dry gas for pressure maintenance, other factors tending to reduce such a probable loss become evident.

Retrograde Loss Evaluated

It has been reported to reinject the dry gas and reprocess the stripped gas, after cycling, when 75 per cent of the reservoir is swept out by the injected gas, that approximately 1.81 lb. of dry gas per thousand cubic feet of reservoir gas is required. Assuming 0.600 gravity, this gives about 40.0 cu. ft. of dry gas per thousand cubic feet of original reservoir gas that must be used to offset the maximum loss of 0.118 gal. of butane plus in the absence of cycling.

The value of 40.0 cu. ft. of dry gas is better seen in terms of liquid hydrocarbon fractions when we apply the present trend of converting 10,000 cu. ft. of dry gas into about 1 bbl. of liquid hydrocarbons, part of which may include usable oxyhydrocarbon chemicals. Thus 40.0 cu. ft. of dry gas becomes potentially 0.173 gal.* of valuable liquefied hydrocarbons. To offset the maximum and highly questionable loss of 0.118 gal. of butane plus, an amount of dry gas, equivalent to 0.173 gal. of hydrocarbon liquefiables, must be expended. Using the equivalent of 0.173 gal. of liquid hydrocarbon material for reinjection, leaks, and processing losses, reference to Fig. 4 suggests cycling is questionable for gas with 0.70 and 0.80 G.P.M. heptanes plus content in reservoirs below and above 200° F. respectively.

The inadvisability of cycling 1.18 G.P.M. gas is further confirmed when we take into consideration the retrograde loss that cannot be prevented due to pressure drop even in the most efficient cycling operation, and when the possibility of revaporization is considered and the subsequent sweeping of condensed hydrocarbon fractions into the well bore by the movement of the formation gas.

Use of Water-Gas for Makeup Injection

As previously noted, the loss of liquefiables increases with increased heptanes plus fraction of the reservoir fluid. Therefore, with higher G.P.M. fluid content, the necessity of cycling becomes apparent unless adequate steps are taken to insure the recovery of the condensed fluids from the reservoir. Should a gas market be present under such conditions the reservoir could probably be conservatively operated in one of the following two ways: (1) A portion of the dry gas delivered to pipe-line operations with the required amount of injected gas made available by water-gas injection and pressure maintenance in the reservoir until the completion of the cycling program, (2) processing the reservoir without cycling and denuding the reservoir of its condensed liquefiables at a lower pressure by sweeping with the lower gravity and lighter water-gas. Before entering into a discussion of these possibilities a description of the method of water-gas production, using "cheap oxygen" and natural gas, may be in order.

Prior to the war, commercial oxygen obtained by fractional distillation of air was carried out to a limited extent. The high cost of this oxygen was occasioned by the high working pressure, and expensive chemical means of removing carbon dioxide and water vapor. Recently, a newer process, termed cheap oxygen, has been developed which uses lower pressures and removes water vapor and carbon dioxide by "cold regeneration methods." Combined with other developments this process suggests that we may be entering a new era in which hydrocarbon gases will not only be used as fuel or a chemical raw material but for both. As an example, in the production of hydrogen for the manufacture of synthetic ammonia, approximately one volume of natural gas was required as fuel to convert one volume of natural gas into water-gas, and subsequent conversion into hydrogen to be used in the synthesis of ammonia. With cheap oxygen available a mixture of steam, oxygen, carbon dioxide, and methane may be made to react under controlled conditions to give water-gas (hydrogen and carbon monoxide). In this process sufficient energy in the form of heat is liberated for process steam and power while the reaction is stopped at the energy level to give the desired water gas; thus the hydrocarbon gas is employed to liberate energy and at the same time be available as a chemical raw material.

One prominent executive in the cycling industry has suggested that with this process it may be possible, in cycling operations, to supply a pipe line with dry gas and make up the required amount of cycle gas with water gas produced from a portion of the dry gas, because one volume of methane gives approximately three volumes of water gas. However, the pressure at which this reaction must be conducted at present, indicates expensive compression rates in high-pressure reservoirs. The application to the second suggested method may be of more practical importance for the following reasons:

When the reservoir is produced in the absence of cycling and when the pressure falls to about 1,000 lb., water-gas production could then be initiated and the reservoir swept out with lighter gravity gas having a low B.t.u. content (about 300 B.t.u. per cu. ft.). Such an operation could have a greater tendency to reevaporate the heavier liquid fractions or sweep them to output wells and the resulting gas would have a higher B.t.u. content than the injected water-gas, even after gasoline removal, and could then be used as fuel or chemical raw material. Full deliveries to pipe line could be currently maintained as only a portion of the gas produced would

TABLE 1—DATA USED IN PRESENT TENTATIVE METHOD

Reservoir Temp.	Heptane plus G.P.M.	Butane plus G.P.M. loss
Reservoirs Above 200° F.		
260	1.570	0.495
254	1.480	0.521
249	1.195	0.276
210	0.783	0.225
252	0.88	0.337
242	0.79	0.159
273	1.095	0.243
236	0.943	0.258
229	0.915	0.25
251	1.047	0.41
201	0.630	0.18
206	0.850	0.23
220	0.418	0.06
217	0.612	0.138
233	0.745	0.132
Reservoirs Below 200° F.		
188	1.368	0.832
186	1.195	0.597
188	1.196	0.517
199	1.123	0.46
193	1.080	0.44
172	0.235	0.04
154	0.393	0.045
150	0.364	0.068

*Calculated from latest data on the Synthine Process.

TABLE 2—LOSSES FOUND FOR GASES FROM INDIVIDUAL FIELDS

Field	Butane plus G.P.M.	Butane plus G.P.M. loss	Loss percentage	Heptane plus G.P.M.
A	1.190	0.18	15.1	0.630
B	0.903	0.04	4.4	0.335
C	1.000	0.06	6.0	0.418
D	1.035	0.045	4.3	0.393
E	1.097	0.068	6.15	0.364
F	1.330	0.138	10.03	0.612
G	1.355	0.122	8.51	0.745

be required to manufacture a volume of water gas equivalent to the natural gas output of the wells.

Naturally, the use of dry gas as both a source of energy and a raw material in the form of water-gas would tend to decrease the fuel requirements, as outlined, to offset the economics of cycling reservoirs of 1.18 G.P.M. and less. Should such a procedure be used in low G.P.M. reservoirs it would, because of the lower-gravity gas, tend to cause a greater amount of reevaporation. The net result would be not to disturb greatly the material balances previously referred to in processing reservoirs having low-G.P.M.-content fluids.

Another interesting and possible method adapted to the recovery of liquid hydrocarbon fractions, which have wet the sand face due to retrograde condensation, is the use of chemicals which selectively reduce the retentivity of absorbed liquids. Present research conducted along these lines suggests such possibilities. Continued investigation along this line should be undertaken to complete the study and properly evaluate its economics, as in the near future the process may become of profound importance in gas cycling operations. Finally, the almost absurd possibility of using nature's reservoirs as high chemical reactors must be recognized. Just as solid fuels like coal have been gasefied in place using their natural beds as huge reactors, so may our gas condensate reservoirs, with their great pressure and high earth temperature, be made to react their hydrocarbon gases with selected and controlled quantities of chemicals to give valuable chemical raw materials and products to be used in the ever-expanding petrochemical industry of today and tomorrow.

Polytreating Eliminates Olefin; Forms Aromatic Hydrocarbons

POLYTREATING improves gasoline quality by eliminating olefins or converting them to aromatics or paraffins, says Dr. Vladimir Haensel and Prof. V. N. Ipatieff, research chemists of Universal Oil Products Co.

A paper by these two research chemists, describing a process which employs solid phosphoric acid polymerization catalyst, shows that the aromatic components of the gasoline used in their experiments remain unchanged to any degree during the reaction. Gasoline of about 300° F. end point, produced by cracking gas oil in a unit using a synthetic silica-alumina catalyst, was employed in the experiments.

Pressure and temperature conditions for the experiments ranged between 400-800 psig. and 350-550° F. Reports show that as operating temperature is increased gasoline fraction yield is decreased with an accompanying olefin-content decrease and an octane-number increase. Optimum operating conditions for polytreating C_5-350° F. gasoline are shown to be under conditions of 600 psi., approximately 510° F. and a space velocity of about one, according to laboratory and pilot-plant runs.

Gasoline treated in the process is said to have high lead susceptibility and the report shows that increases in octane ratings of the leaded gasoline are greater in the F-3 test than by the Motor Method.

The amount of residue produced by the reaction depends upon the olefin content of the charging stock and upon the degree of treating. Yields of 87-88 per cent of gasoline, similar in octane rating to the first-stage gasoline, are reported where the residue is cracked by the catalytic process. Condensable gas is shown to be about 8 per cent and noncondensables are said to be very low. Reports show that olefins comprise a large portion of the condensable gas which, when processed in polymerization units, increase the over-all yield of high-octane gasoline.

Lube Oils Classified as to Duty Requirements

NEW YORK.—Outstanding advances in the manufacture and uses of lubricating oils have necessitated the development of new bases for classification of such oils, especially crankcase oils. Formerly crankcase oils have been classified on the basis of viscosity only, for which the well-known S.A.E. grades have been determined. More recently wide differences in the service for which different oils are used, and the greatly varying demands made on oils in different services have made it necessary that a new classification be developed. This new classification has been developed by the lubrication committee of the division of marketing, American Petroleum Institute, and divides crankcase oils into three groups as follows:

Regular motor oil.—This term shall be used to designate a straight mineral oil. Oils of this type are generally suitable for use in internal-combustion engines under moderate operating conditions.

Premium motor oil.—This term shall be used to designate an oil having proved oxidation stability and bearing-corrosion-preventive properties. Oils of this type are generally suitable for use in internal-combustion engines where operating conditions are such that regular oils do not give satisfactory service.

Heavy-duty motor oil.—This term shall designate an oil having proved oxidation stability, bearing-corrosion-preventive properties, and detergent-dispersant characteristics. Oils of this type are generally suitable for use in both high-speed diesel and gasoline engines under heavy-duty service conditions.

As the definition states, the regular class of oils does not contain any material other than mineral oil, and is recommended for use where the duty, that is, the operating conditions are mild or moderate, relatively low temperatures, minimum of contamination, or other conditions which tend to destroy or damage the qualities of the oil. The premium oil is one which is generally treated with an antioxidant which retards oxidation and the formation of sludge, acidic or other corrosive constituents.

The heavy-duty oil is a type which has been in use for several years particularly in truck, bus, tractor, and other engines where the duty is severe with high temperature, heavy contamination, and oxidizing conditions all present to an advanced degree.

Discussion of this subject should be directed to the standards department, Society of Automotive Engineers, 29 West 39th Street, New York 18, N. Y.

BOOKS

HYDROFLUORIC ACID ALKYLATION. Chemical Products Department, Phillips Petroleum Co., Bartlesville, Okla. 366 pp. $7.50.

This newest of the catalytic alkylation processes to be adapted to commercial operations was developed largely during the war years, and jumped directly and almost literally from test tube to large-scale commercial plant overnight because of the critical need for haste. Much material has been published on the subject but nowhere has this material been assembled, correlated, and systematically presented until the publication of this volume.

Written by the technical staff of Phillips Petroleum Co., the book has a large percentage of tabular data on the reactions, products and their properties, yields, etc., of the process. Much of these data are taken from the records of that company, and from the several editions of the "Blue Books" which supplied the data and know-how to various refiners operating the process for making aviation alkylate. In all, 17 Blue Books went into the making of this volume, the data in which were correlated and brought up-to-date.

The book is divided into five general parts: chemistry; design, operation, and operating conditions of alkylation units; alkylation of specific types of hydrocarbons; metallurgy and materials; and safety and general considerations. A great deal of attention is given to the design and use of special equipment for this special purpose, to the unique properties of the HF catalyst, and to the layout of units. Detailed drawings of valves and other special equipment are given. Detailed flow charts are shown along with specific yields, and other data of immense value to the practical engineer and chemist interested in learning the practical aspects of this process.

IT'S SIMPLE ARITHMETIC

You don't have to use calculus to determine how Helicoid Gages can save money. Nor do you have to be a Quiz Kid. It's a question of simple arithmetic.

If your average gage lasts 90 days and the average cost is $10.00, your average cost per year is $40.00 per gage. Since the Helicoid Gage will outlast the ordinary gage about 10 to 1 and the average initial cost is the same, the use of Helicoid Gages will reduce your average cost per year to $4.00 per gage. Your saving in a year is $36.00 per gage, multiplied by the number of gages you use.

These are conservative figures. We have heard of savings of $90.00 per gage in a year when the gage service is really tough. On the basis of using only 100 gages per year, that's a nice saving of $9,000.00.

SEND FOR THIS CATALOG

See your nearest distributor. Meanwhile send for our catalog—the only technical catalog published on pressure gages.

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE
Bridgeport 2, Connecticut

PENBERTHY EJECTORS

Use the power of steam, air or water under pressure to lift liquids. Being simple jet pumps they have no moving parts and require no lubrication. A variety of models to meet different conditions. Also used as water heaters.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Nowery J. Smith COMPANY

GALVANIZING DIVISION

Hempstead Hwy. & Eureka St.
P. O. Box 7398 — Tay. 6111
HOUSTON, TEXAS

Successor to

ROGERS
GALVANIZING CO.

HOT DIP Custom Galvanizing

"PROMPT SERVICE"

No Job Too Big or Too Little

WATER-BASE MUD —A Review of Developments

by W. R. Kelley, T. Fenton Ham,† and A. B. Dooley‡*

THE effects of water-base muds and their constituents on well productivity have in recent years received extensive study.

The various water-base muds in use at present in California fields, their composition, characteristics, field application, some record of their use and criteria for selection are briefly discussed here.

This comprehensive paper was delivered at the spring meeting of the A.P.I. Pacific Coast district, held at Los Angeles. It is printed here in slightly abridged form. A kindred paper, on oil-base muds, and presented at the same meeting, was published in the Journal's April 27 issue.

Types of Water-Base Muds and Their Use

Drilling practice has developed three general types of water-base muds which may be described as follows:

(a) Clay fresh-water-base muds.—Clay fresh-water-base muds are by far the most commonly used in general drilling and completion practice. A wide variety of mud characteristics can be obtained by a choice of native California clays or a blend of native clays and bentonite. The qualities and physical properties of these muds, such as viscosity, thixotropy, and filter loss, are adaptable to control and modification by treatment with chemicals.[1] The term "fresh-water-base mud" in this paper is used to designate this type of mud.

(b) Organic colloids.—Organic colloids recently have had extensive use in compounding water-base muds. A commercially prepared modified starch (Impermex) is commonly used. Muds with low-filter-loss characteristics can be compounded by the addition of modified starch to water-base muds with less difficulty than would be experienced by addition and treatment of clay colloids to secure similar characteristics. Another feature of muds compounded with modified starch is their relative immunity to contaminants such as saline water, cement cuttings and other detrimental materials which so adversely affect the clay constituents of water-base muds. This permits preparation of a mud having a filtrate of minimum hydration effect on clay formations or clay native to oil sands, as well as a low-filter-loss characteristic and a thin filter cake.

Modified starch normally will ferment in the mud system and must be preserved or sterilized by maintaining a pH in the range from 11.5 to 12.5 or by the addition of a commercial preservative. The use of a preservative is usually better for normal drilling operations. However, sterilization by maintenance of a high pH may be more desirable when drilling in productive intervals because after completion the starch in the remaining cake and mud particles will ferment and disintegrate more rapidly. The pH of the system may be regulated by

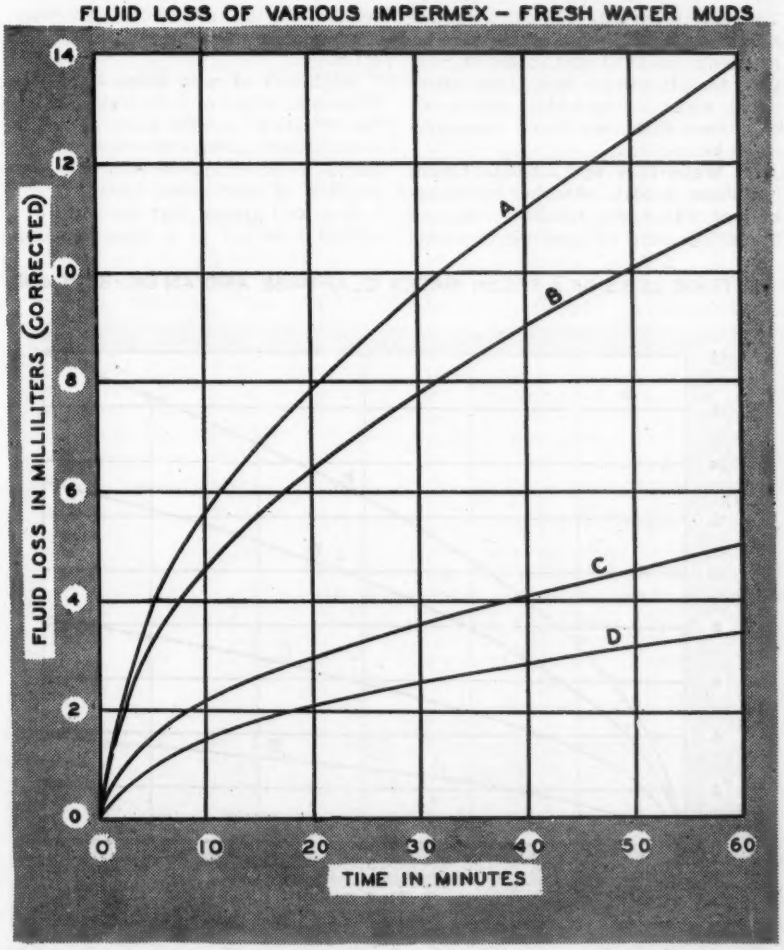


Fig. 1—Composition of mixtures (72 lb. per cu. ft. native clay base in all cases): A. 15-lb.-per-bbl. Bentonite; B. 10-lb.-per-bbl. Bentonite, 5 lb.-per-bbl. Impermex, 1-lb.-per-bbl. preservative; C. 5-lb.-per-bbl. Bentonite, 10-lb.-per-bbl. Impermex, 1-lb.-per-bbl. preservative; D. 15-lb.-per-bbl. Impermex, 1-lb.-per-bbl. preservative

*General Petroleum Corp. †Superior Oil Co. ‡Belridge Oil Co.

additions of caustic (NaOH), hydrated lime [$Ca(OH)_2$] or, in some cases, by addition of cement.

Salt-water-base muds with characteristics equal to the best fresh-water-base muds can be compounded by the addition of a modified starch.[2,3] It is interesting to note that in two instances starch muds having a salinity of 5,000 grains per gallon of chloride ion have been compounded and used successfully. In each case the muds were stable and relatively easy to control. It was noted that cuttings from the hole seemed to disintegrate and blend less readily in the highly saline muds than in ordinary muds.

Reference to Fig. 1 illustrates the influence of a modified starch on fresh-water muds.

It is preferable to determine the purpose for which a mud is to be used, then compound it in advance for the specific purpose that it is to accomplish. For example, after a modified starch mud is put into use salt cannot be promiscuously added nor is it advisable to change the metallic ions of the base used for pH control. The best procedure for compounding modified starch mud is to mix ingredients such as salt, alkaline reagent for pH control and preservative in the water before adding starch and clay, thus obtaining stable characteristics before use.

(c) Water-base and oil-base blends (emulsion muds).—Another modification of water-base muds is achieved by adding some oil-base mix to a clay water-base mud. Normally the oil-base mix consists of a vegetable oil, a saponifying agent, and a light-refined or crude-oil base. It is presumed that the blend of the oil-base mix in the clay water-base mud yields stable emulsions which are effective in the reduction of filter loss and the production of a thin soft mud cake.

This type of mud has been successfully used in several instances to correct "tight hole" conditions.

The possible influence of the oil contained in water-base and oil-base blend on the appearance and fluid content of recovered cores should not be overlooked when coring.

The effect on the filter-loss characteristic of a fresh-water mud by addition of a prepared oil-base mix is illustrated in Fig. 2.

Factors Influencing Choice

Many factors influence the choice of a mud for a particular job. The most important factors are: (a) effect of mud cakes on the hole, (b) effects of mud filtrates on sand permeability, (c) effects of mud particles on permeability, (d) effects on electrical logging, (e) effects on cementing, and (f) costs.

(a) Effect of mud cakes.—The hydration qualities of mud materials and the effects of soluble material in the environment of these particles are reflected in the characteristics and composition of mud cakes formed.

It is well known that the walls of a drilled hole act as a filter medium.

TABLE 1—STRENGTH OF MUD CAKES MEASURED IN CMS. OF HG. OVER ⅜-IN. HOLES

Kind of mud—	Breaking pressure— 17-hour cakes	64-hour cakes
Native clay	12	33
Bentonite	22	..
Bentonite — Impermex calcium ion	2	..
Bentonite — Impermex sodium ion	6	..
An oil-base fluid	2	2
Oil-base and water-base blends	Visual examination indicates mud cakes are soft and low in strength.	

TABLE 2—PER CENT SOLIDS BY VOLUME IN MUD CAKES

Kind of mud—	Per cent solids by volume
Native clay No. 1	47.3
Native clay No. 2	33.0
Bentonite No. 1	7.5
Bentonite No. 2	6.7
A hydratable mineral	4.5

The filter-loss characteristic, temperature, pressure,[5] time, and permeability of the media are controlling factors in determining the amount of fluid loss and the quantity of solids deposited on the hole wall.

Reference to Table 1 indicates that the strength of mud cakes, which depends upon the hydration characteristics of the solids in the mud, can be varied by choice of material used.

Much concern has been expressed over the adverse effects which mud cakes may have on well productivity. Excess mud-cake deposit may effect the distribution of fluid flow into liners and consequently affect the service and efficiency of these liners. Formation pressures and volumes of fluid produced per unit of area are other factors modifying such damage.

Table 2 shows the per cent of solids by volume in mud cakes formed by various muds. Strength of cake and per cent of solids by volume are not necessarily related. Cakes having a large water volume and less total solids per unit volume will stay soft longer and, therefore, may be produced from the well more easily. Also, any residual cake in the well, if dehydrated by formation water or treatment, will offer less interference to flow.

The commonly used organic colloids offer another method of mud-cake regulation. These organic materials probably disintegrate in time. The time of decomposition will vary with the selection of the preservation measures used in the drilling fluid, and treatment to encourage decomposition of these organic materials will minimize interference to production by residual mud cake. Organic colloids are more stable and more resistant than clay colloids to flocculation by electrolytes or other contaminants. This permits formation of a protective mud cake which is relatively immune to cement contamina-

FLUID LOSS OF A FRESH WATER CLAY-BASE AND AN OIL-BASE MUD

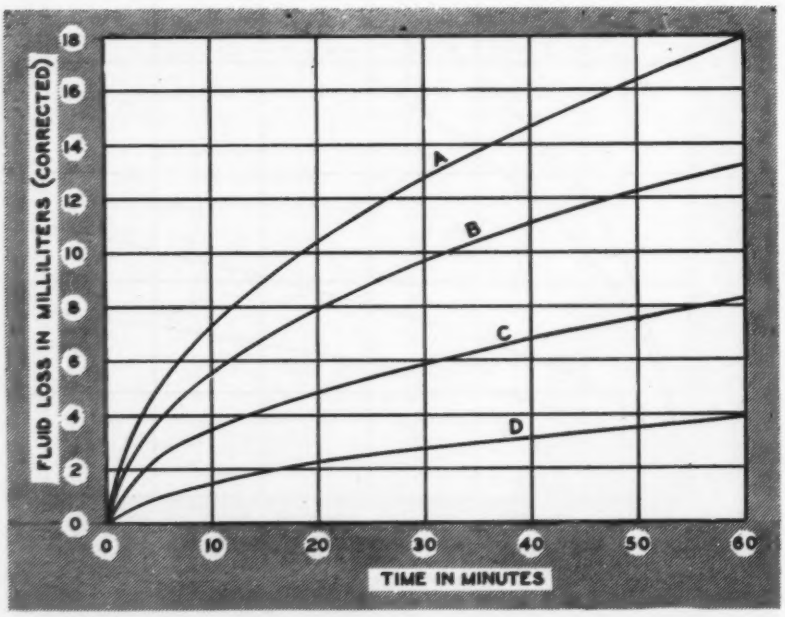


Fig. 2—Composition of mixtures (79.5-lb.-per-cu.-ft. native-clay base; 56.5-lb.-per-cu.-ft. oil base): A. 79.5-lb.-per-cu.-ft., 100 per cent clay-base mud; B. 78-lb.-per-cu.-ft., 95 per cent clay-base with 5 per cent oil-base mud; C. 76-lb.-per-cu.-ft., 85 per cent clay base with 15 per cent oil-base mud; D. 72.5-lb.-per-cu.-ft., 70 per cent clay base with 30 per cent oil-base mud

tion effects or other flocculating material in a mud.

A mud composed essentially of an acid soluble material such as calcium carbonate and modified starch forms a cake which offers some theoretical advantages, for the mud cakes formed are subject to nearly complete destruction by acid treatment.

(b) Effects of mud filtrates on sand permeability. — The detrimental influence of fluids, mud filtrates, and muds on reservoir permeability has received considerable study, and some excellent literature has been presented on the subject.[5]

Clay or clay-like materials, either as solid constituents of mud intruded into sand pores or as a native component of a formation, adsorb or otherwise hold volumes of water by definite forces. The hydration forces of clay particles, and the resulting volumes of fluid held, vary with the chemistry of the particle and soluble material in its environment.[6] The magnitude and mechanics of these forces have been described in a study of heaving-shale problems.[7] The mechanics of these forces may reasonably be applied to a study of the effects of clay hydration on sand permeability. The resulting inference is that forces are developed within a clay or mud-filled sand which in many instances may exceed reservoir pressure and result in permanent blocking of flow channels.

A reduction of sand permeability because of hydration forces has been previously suggested.[8] Laboratory work has shown that many formation cores have a greater permeability to sodium chloride solutions than to fresh water, and within limits, permeability increases with an increased sodium chloride concentration. Further laboratory evidence supports the belief that the permeability of a composite clay-sand can be influenced by variation in the kind and concentration of ions introduced or present in the clay sand. Thus, by the addition of certain ions in the mud filtrate or in treating fluids, the amount of hydration may be minimized or reduced. Laboratory data indicate reduction of hydration forces by external treatment to be a difficult or at least a slow process to perform. This problem deserves further study in order to develop a better general understanding of the factors involved, so that they may be controlled and used in completion practice. Some laboratory data and meager field evidence support the contention that dehydration effects of clay particles within and surrounding the well bore do occur; so adoption of practices designed to reduce hydration forces (dehydration) in the formation should become increasingly important in well treatment. Dehydration treatment has been applied to wells by application of acid and saline solutions, but generally with little apparent effect.

Hydration of clay material in unconsolidated sands may set up pressure barriers at variable distances from the well bore and thereby encourage sloughing of sand into the liner as the well is brought in. Hydration of shale sections between sands may encourage sloughing and create impermeable barriers between sand bodies and the liner.

Procedures

Based on present concepts, the following procedures are generally used in field practice when drilling or working in a productive zone:

1. Minimum filter-loss quality is maintained with fresh-water muds. This reduces the radius to which hydration of formation clay material takes place and minimizes the quantity of mud cake deposited on the wall.

2. Salt-water-base muds have been used in some areas where laboratory data indicate that the permeability of the sands is greater to salt water than to fresh water. The purpose is to minimize hydration of the clay constituent in the sand with a saline filtrate. Oil-base muds are used for a similar purpose, but discussion of their application is outside the scope of this paper.

3. An effort is made to expose the pay zone to drilling fluids for as short a time as possible.

4. Minimum safe hydrostatic heads are maintained.

5. Washing, scratching, and wall scraping procedures are used.

6. Hydration effects on formation clays are considered in the selection and use of mud treating agents.

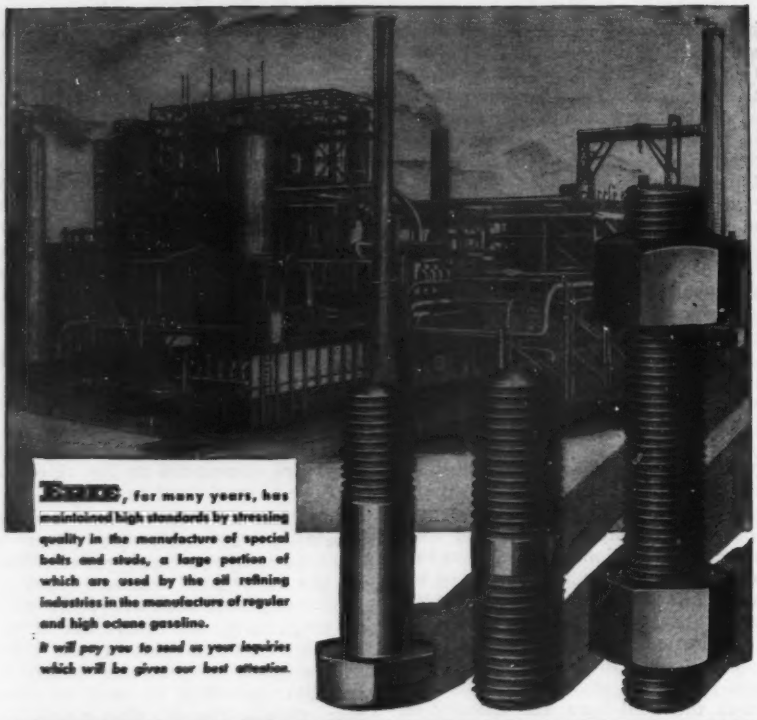
(c) Effect of mud particles on permeability.—To study the effect of mud particles on sand permeability in the laboratory, various types of mud fluids were used to deposit cakes on prepared porous media free of hydratable material. This type of filter was selected to isolate as nearly as possible the effect of mud particles from filtrate effects. After deposition of a cake the direction of fluid movement was reversed and resultant differences from the initial permeabilities of the porous medium noted. The effect of an acid wash and, to a limited extent, results of a mechanical agitation of the residual cake were also noted. Results of the experiments are presented in Table 3.

It will be noted that in two cases brushing the filter medium improved the permeability. This is mentioned only to indicate that mud-particle effects may be confined near the surface. However, it should be pointed out that all the muds tested had low filter losses and that muds with higher filter losses could give different results. Duplication of this practice in a well would require severe washing and scratching procedure while the well was producing fluid, for washing and scratching of the sand face under hydrostatic heads in excess of formation pressures could conceivably result in deeper penetration of mud particles into the oil sand.

Clays should be thoroughly hydrated by adequate mixing and treatment before use in a well, since it is a reasonable assumption that the state or degree of particle hydration attained in a mud will influence the degree to which the mud particles affect sand permeability. For example, to regain lost circulation we endeavor to introduce partially hydrated clay particles into the open channels of the formation anticipating that later more complete hydration of the clay particles will plug the openings. Use of mud fluids containing incompletely hydrated clays while drilling in oil sands can be expected to cause similar results within

TABLE 3—EFFECT OF MUD PARTICLES ON PERMEABILITY

Kind of mud (all muds very low fluid loss)—	Initial permeability	Per cent of initial permeability regained after cake deposit: Immediate	Max.	Subsequent treatment	Per cent of initial permeability regained after treatment
1. Bentonite with all small particles	4,340	82	90	Acid wash	91
	463	49	86	Acid wash	84
	72	0	.06	Acid wash	.06
2. Native clay, bentonitic plus modified starch organic colloid, pH-12	2,480	63	100	None	..
	420	28	99	None	..
	64	14	86	None	..
3. A salt-water-base mud with organic colloid at pH-12	3,380	6.8	52	Wire brush	94
	480	17	38	Wire brush	86
	78	60	85	Wire brush	98
4. Same as No. 2 with preservative, pH-8	3,780	75	95	Acid wash	96
	514	60	67	Acid wash	102
	95	85	73	Acid wash	94
5. Oil-base No. 1	3,640	74	78	Wire brush	90
	500	60	62	Wire brush	83
	88	68	94	Wire brush	86
6. Oil-base No. 2	High perm.	92	96		..
	Med. perm.	90	93		..
	Low perm.	91	91		..



ERIE, for many years, has maintained high standards by stressing quality in the manufacture of special bolts and studs, a large portion of which are used by the oil refining industries in the manufacture of regular and high octane gasoline.

It will pay you to send us your inquiries which will be given our best attention.

ERIE BOLT & NUT CO.

ERIE, PA.

STUDS • BOLTS • NUTS ~~ ALLOYS • STAINLESS • CARBON • BRONZE

PAGE FENCE *-Since 1883*

• AMERICA'S FIRST WIRE FENCE •

Buy Your Fence as You Buy Insurance

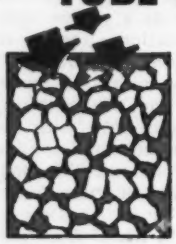
• When you choose protection for your property, buy the fence that is best suited to your individual needs. You can have a long-lasting Page Chain Link Fence in a choice of four superior metals, one of which will be best for you: 1. Corrosion-resisting Page Aluminum. 2. Page Copper-Bearing Steel, heavily galvanized. 3. Page-Allegheny Stainless Steel, immune to rust. 4. Page-Armco Ingot Iron, purest commercial ferrous metal. And you can have your fence erected by a nearby fence engineering firm which is long-experienced and reliable. Write to any office listed below for illustrated information.

For name of nearest member firm, write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, Pittsburgh, New York or San Francisco

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.

MORE Tungsten Carbide per dollar!

when you buy TUBE BORIUM!



TUBE BORIUM assures surfaces of closely-packed, long-wearing tungsten carbide particles with minimum unprotected areas between.

Rods with low carbide content mean fewer particles per inch—more open areas subject to abrasive attack.

For most tungsten carbide per tube, for longest life to wearing parts, get the best—specify TUBE BORIUM!

BECAUSE of its intense hardness, tungsten carbide resists wear better than any other metal—life increase of parts being proportional to the amount of carbide particles present. For this reason you get more life with TUBE BORIUM . . . 60 per cent of its content is tungsten carbide — a far greater percentage than is found in average rods! Furthermore, the particles are of special shape, being uniformly compact and nearly cubicle. Absence of slivers prevents shattering and loss of carbide, pays off in added service and fewer shutdowns!

UNIFORMITY. . . Machine manufacturing assures absolute uniformity. Alloying elements are tightly rolled in mild steel tubes. No blank areas.

AVAILABLE IN TWO TYPES

For oxy-acetylene or D.C. electric application. 3/16" or 1/4" rod sizes are priced at $3.15 per lb., f.o.b. Whittier, California, or distributor's warehouse. Buy a few pounds today and test TUBE BORIUM on earth cutting or scraping equipment!

Free booklet on **STOODY ALLOYS** describes hard-facing applications for all wear problems. Write for your copy!

STOODY COMPANY

1138 West Slauson Ave., Whittier, California

STOODY HARD-FACING ALLOYS

Retard Wear Save Repair

sand pores thereby seriously reducing the sand permeability to the fluids expected to be produced.

(d) Electrical logging. — The character and definition of the curves of an electric log are altered by the type of mud that is used in the hole. The curves of a log made in the presence of some modified starch muds are not always directly comparable to those of a log registered in the presence of regular clay mud. This may be due to soluble materials in the mud which tend to flatten the normal self-potential curve, and in cases where high concentrations of salt are used, a curve showing a reversal of values may be recorded. Resistivity curves are generally comparable but may record a lower value in the presence of low resistivity muds. Correlations can usually be made between logs recorded in any of the water-base type muds without undue difficulty, but interpretation of formation characteristics such as texture, fluid content, and relative permeability from logs made in an organic colloid water-base type mud is rendered difficult by lack of the extensive background of experience that is available when working with logs recorded in clay fresh water-base muds.

Electric logs made in oil-base and water-base mixtures exhibit the same general character as those made in clay fresh water-base muds.

(e) Cementing.—The problem occasioned by the reaction between fresh water mud and cement in which both may be harmfully affected, is widely recognized. This reaction can be minimized by the use of water slugs to separate the two.

Treatment of mud for deleterious cement effects or pretreatment of mud for anticipated cement contamination is generally practiced by mud engineers. However, it should be reiterated that all clay fresh-water muds are adversely affected by cement, and once contaminated, require extensive chemical treatment to restore proper qualities. Chemicals used to treat muds can detrimentally affect the setting time and strength of cement when injudiciously used.

Cementing operations can normally be conducted as usual with starch muds, with the exception of starch salt water mud, in which case the salt tends to thicken the cement slurry and hasten setting time.

Modified starch muds are less harmfully affected by cement than plain clay water muds. A modified starch mud prepared with hydrated lime or cement for pH control is relatively immune to the adverse effects of cement contamination.

Cementing operations are conducted as usual where water-base and oil-base blends are in use, but contamination by cement develops high viscosities and undesirable gel properties. These effects may be the result of reaction between calcium and magnesium ions in the cement and the vegetable oil soaps of the oil-base constituent. Conditions of this type have been overcome in some cases by dilution of the mud with water followed by addition of clay or bentonite and oil-base mud until the desired characteristics were restored. Chemical treatment likewise has been successfully applied to this type of mud.

(f) Costs.—The cost of chemically treated water-base muds varies from 30 to 75 cents per barrel, provided that no weighting material has been added.

Organic colloid mud costs vary from $1.50 to $2.50 per barrel depending on the original clay used, the concentration of modified starch, and other necessary ingredients such as caustic, hydrated lime, commercial preservative, or salt.

Water-base and oil-base blend mud costs range from $2.00 to $2.50 per barrel depending once again upon the cost of the original clay used. The concentration of oil-base mud is usually maintained at approximately 25 per cent of the total volume of the mud. Chemical treatment of this type of mud can be expected to run higher than chemical treatment of other types.

When special muds are used, it becomes increasingly important to have adequate supervision. Unless such muds are carefully watched, they may get completely out of control and may have to be replaced, which is not only an expensive procedure but may invite serious hole trouble as well.

Conclusions

1. Laboratory data and scattered field evidence[8] indicate that mud filtrates, mud cakes, and mud particles decrease optimum well productivity in varying degrees.

2. (a) By prudent application of the knowledge gained from accumulated data, operators are trying to reduce the detrimental effects of muds on the oil zones. Where high formation pressures, high permeabilities and low fluid viscosities are anticipated, efforts to achieve optimum productivity indices become less important.

(b) The various muds described have important applications in the mechanics of drilling, casing and completing wells. Long intervals of open hole, troublesome formations, low clearances for tools or casing, and long periods of suspended circulation require expert mud supervision.

3. Further laboratory and field experiments are justified on the basis of present information.

4. It is difficult in most cases to make good qualitative completion comparisons and still more difficult to make quantitative studies because of varying individual well conditions, which may mask results of a specific procedure used.

5. There are many factors which need to be known in order to determine the effect of drilling fluids on productive intervals. Some are listed as follows: (a) Representative sand permeability data; (b) formation pressures; (c) viscosity of the oil in place; (d) gas-oil ratios; (e) water cut; (f) productivity index data over a period of time after well completion; (g) relative influence of mud filtrates, formation water, saline water, or fresh water on representative formation samples. Laboratory experiments on the effects of the various waters should duplicate field conditions as nearly as possible; (h) type and description of completion methods used; (i) degree of sand consolidation; (j) complete characteristics of the drilling fluid used; (k) length of time the productive interval is exposed to drilling fluid, and (l) completion date in relation to field history.

6. There is evidence to support the basic concepts presented in this paper. However, in many cases only inferences are possible.

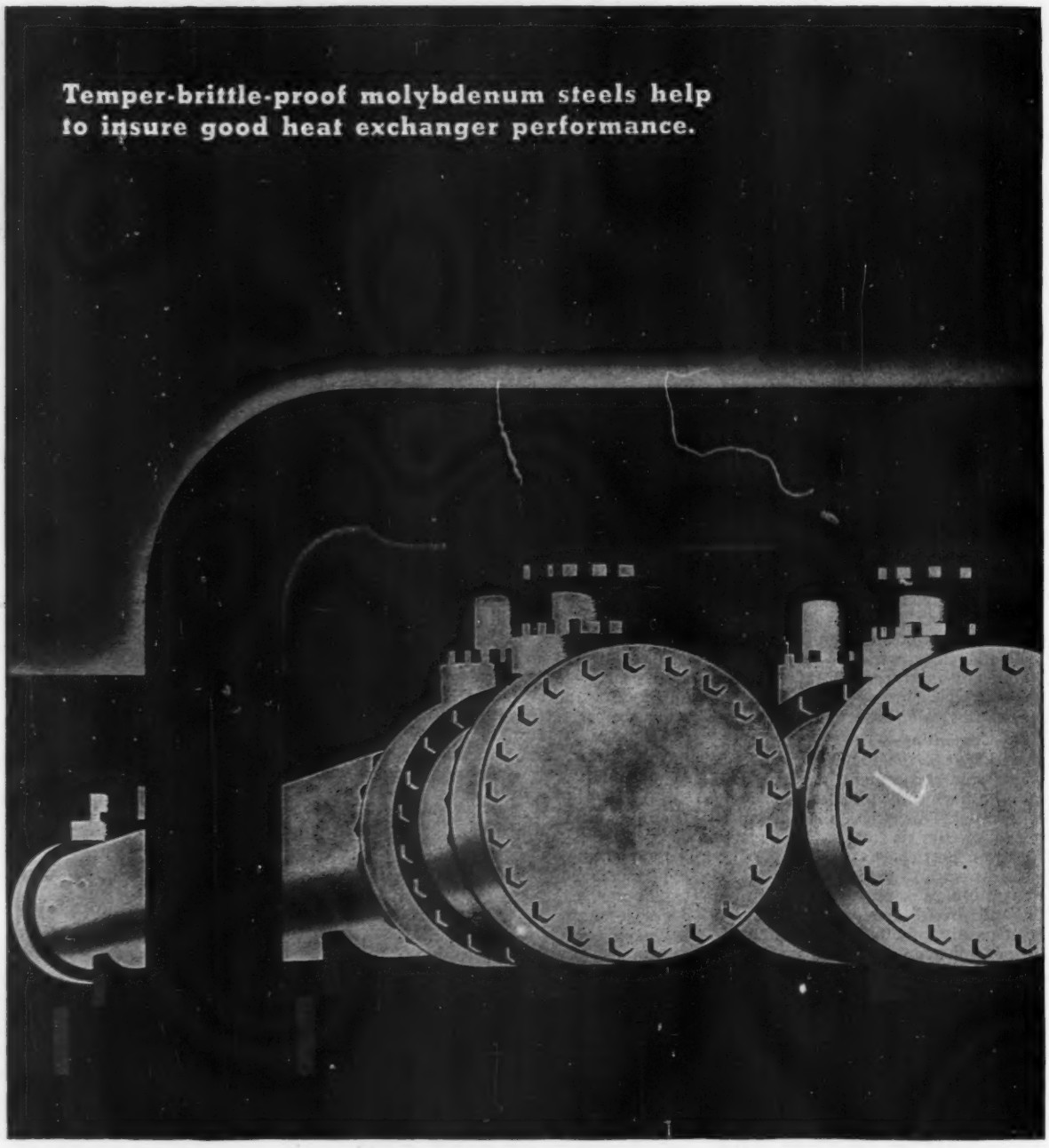
7. By drilling a carefully selected well with the best drilling fluid available and then killing the well with less desirable fluids, we should obtain results which would add materially to our knowledge of the reactions of a productive sand to the various types of muds and treatment. Pertinent data such as productivity indices could then be obtained at specific times after different fluids are employed in the well, leading to more quantitative conclusions on mud behavior in well completions.

Bibliography

1. George Fancher and R. L. Whiting, "Response of a Gulf Coast Drilling Mud to Chemicals, Temperature and Heat Treatment," A.I.M.E. Petroleum Technology, Mar. 1943.
2. Frank Perkins and B. C. Craft, "Effects of Certain Gums and Starches on Filtration of Salt-Water Muds at Elevated Temperatures," A.I.M.E. Petroleum Technology, Jan. 1943.
3. G. R. Gray, J. L. Foster and T. S. Chapman, "Control of Filtration Characteristics of Salt-Water Muds," A.I.M.E. Petroleum Technology, Sept. 1941.
4. Donald C. Bond, "Positive Colloid Muds for Drilling Through Heaving Shales," A.I.M.E. Petroleum Technology, Jan. 1944.
5. Norris Johnston and C. M. Beeson, "Water Permeability of Reservoir Sands," A.I.M.E. Petroleum Technology, May 1945.
6. H. H. Power, C. R. Houssiere, Jr., "Chemical Treatment of Bentonitic Suspensions and the Relationship to the Heaving-Shale Problem," A.I.M.E. Petroleum Technology, Nov. 1941.
7. H. H. Power, Barnaby L. Towle, and J. B. Plaza, "Hydration-Pressure Relationships in Clays and Heaving Shales," A.P.I., Nov. 10, 1942.
8. W. A. Alexander, "Oil Base Drilling Fluids Often Boost Production," Oil Weekly, Vol. 115, No. 1.

J. H. Rambin, formerly chief petroleum engineer, Louisiana, Arkansas and East Texas division, The Texas Co., New Orleans, is the new assistant division manager. **S. T. McCardell,** formerly assistant division engineer, has been made division engineer succeeding Rambin.

Temper-brittle-proof molybdenum steels help to insure good heat exchanger performance.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

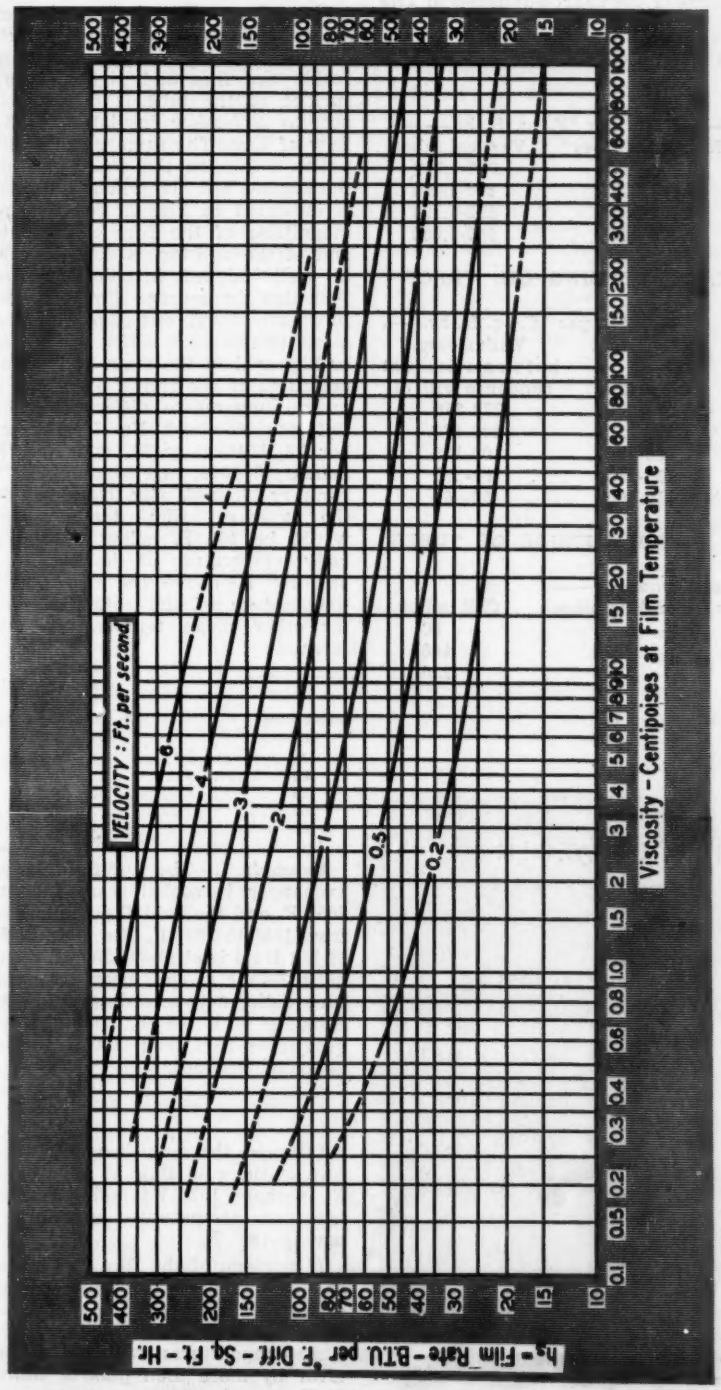


Fig. 1—Transfer rates on outside of exchanger tubes, clean petroleum liquids. Outside ¾ to 1¼ o.d. tubes. (For in-line tubes decrease by 15 per cent)

Heat Rates Outside Tubes

FILM-TRANSFER rates for steam condensing on the outside of tubes are so large that they are of little importance (see Table 1). However, even 1 per cent of air or inert gas reduces the rates to about half and hence the rates given in Table 1 should be used only for systems in which air is swept out either by bleeders or by passage of steam through the system to the atmosphere. Steam-condensing rates are a function of the temperature difference across the steam film and hence if great accuracy is necessary, a trial-and-error computation must be undertaken—in which the temperature difference is assumed, the over-all transfer rate or resistance is computed, and then a more correct assumption of the temperature difference can be made.

Film rates for the condensing of oil vapors, particularly in the presence of steam are not completely understood. Table 2 which gives values of the film condensation rate (Petroleum Refinery Engineering, McGraw-Hill Book Co., New York) may be used until better data are available.

Liquids Outside Tubes

Water on the outside of the tubes gives the very high film-transfer rates shown in Table 3. Velocities up to about 1 ft. per second may be obtained by the natural convection currents of the water but higher velocities require forced circulation. The highest natural convection velocities are obtained with large temperature differences between the water and the condensing vapor (also for widely spaced tubes) and the lowest velocities occur in small equipments operating at small temperature differences between the two fluids.

(Continued on next page)

No. 92 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

Film-transfer rates for oils on the outside of conventional exchanger tube bundles are shown in Fig. 1. The rates are based in part on commercial exchanger studies (Petroleum Refinery Engineering, 2nd Ed., page 400, McGraw-Hill Book Co., Inc., New York) and in part on data published by Buthod and Whiteley (No. 10 Shell-Side Film Coefficients, The Oil and Gas Journal, page 129, August 26, 1944). Note that the velocity should be determined by means of the chart published in The Refiner's Notebook No. 89, page 166, April 20, 1946. The viscosity should be taken at the estimated average temperature of the film of oil.

TABLE 1—FILM-TRANSFER RATES FOR CONDENSING STEAM

Temp. difference across steam film	B.t.u. per °F.-sq. ft.-hr. Horizontal tubes	Vertical tubes
5° F.	3,000-4,000	1,000-1,700
10	2,500-3,300	800-1,400
30	1,800-2,500	600-1,100
50	1,600-2,200	550-1,000

TABLE 2—FILM-TRANSFER RATES, CONDENSING OIL VAPOR

Material—	B.t.u. per °F.-sq. ft.-hr. No steam	With steam, but steam does not condense with oil
Natural gasoline	210-250	170-210
Gasoline	180-220	130-170
Kerosene	150-190	100-120
Gas oil	130-180	60- 70
Wax distillate	110-160	50- 60

TABLE 3—FILM-TRANSFER RATES, WATER OUTSIDE OF TUBES

Velocity	Tubular equipment— Staggered tubes	In-line tubes	Coil in box
0.2	....	....	80
0.5	380	320	140
1.0	540	460	220
2.0	770	650	....
4.0	910	770	....
6.0	1,060	900	....

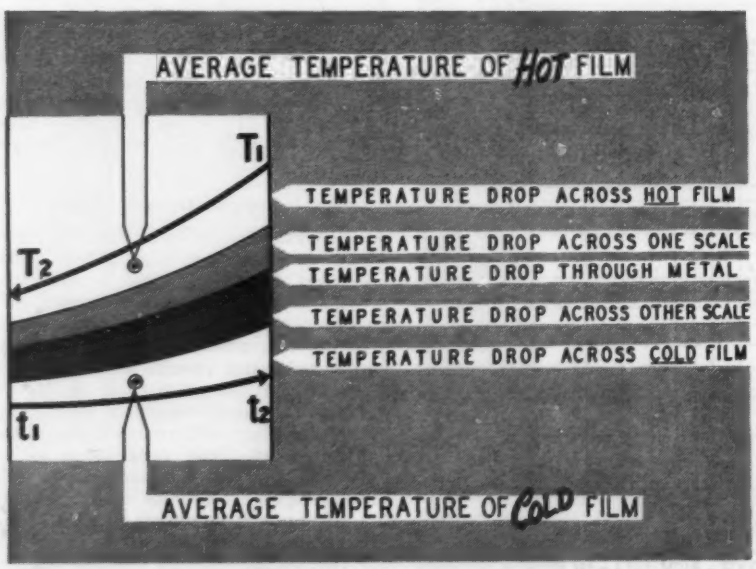


Fig. 2—Temperatures (or resistances) through the films, scales, and metal of a heat-transfer surface

Average Film Temperature

Near the surface is a somewhat stagnant film of fluid through which heat is transferred by conduction. Inside the film and right on the surface of the tube is dirt which acts as a further insulator to the flow of heat. The same general situation exists on the other side of the surface and the whole situation is indicated in Fig. 2. Usually the magnitude of the film coefficients and of the resistances due to scale in well-designed installations, are such that the average film temperatures are about one-eighth of the mean temperature difference lower or higher than the main body temperatures of the fluids. Thus, for a mean temperature difference (The Refiner's Notebook No. 73, December 22, 1945, page 91, and No. 75, January 5, 1946, page 85, and No. 77, January 19, 1946, page 99) of 80° F., the average film temperatures would be 10° F. below the main body temperature of the hot fluid and 10° F. above the main body temperature of the cold fluid—or for other mean temperature differences:

Mean temp. diff.	Subtract or add to main body temp. to obtain approx. film temp.
40	5° F.
80	10
120	15
160	20
200	25

Example 1.—The hot fluid in an exchanger is cooled from 400° to 200° F. and the cold fluid is heated from 100° to 200° F. The main body of hot fluid is at about 300° F. (perhaps 297° F.). The mean temperature difference according to Notebook No. 75 is 145° F. Thus, the approximate film temperature of the hot film is about:

$$300 - 145/8 = 282° \text{ F.}$$

Likewise the main body temperature of the cold fluid is about 150° F. (perhaps 152° F.) and the average film temperature is approximately 168° F.

If any one of the film resistances or scales of dirt is abnormally large or small, the above relations are not exact, but in most instances the film temperatures will not be in error by more than plus or minus 5° F.

Engineering Fundamentals No. 234

A FEATURE OF THE OIL AND GAS JOURNAL

Elements of Surveying—The Instruments—2

THE alidade is used with the plane table to determine horizontal angles graphically. Technically these should be spoken of as a "plane table and alidade" but more commonly the combination of the two is called simply a "plane table." Unlike a transit the alidade does not have a vertical spindle about which the telescope is turned. The spindle is unnecessary because the equipment is oriented by turning the table and alidade together; the telescope is directed at other points by turning the alidade on the board about the plotted position of the point occupied. In all other respects it is very similar to a transit since it has a conventional surveyor's telescope mounted on a horizontal axis and is equipped with a vertical circle and vernier. However, the vertical scale is usually a Beaman stadia arc rather than the conventional scale divided into degrees. The Beaman stadia arc will be discussed in a later article.

The chief use for the plane table is to construct topographic and geologic maps in the field. It should be pointed out that speed and accuracy with a plane table can be mastered in a few days, at most, by a good transitman. Hence, if conditions favor the use of the plane table, the instrument man should not turn "thumbs down" on it simply because he has never operated one.

Level-bubble tubes.—All of the instruments discussed previously are equipped with one or more level bubble tubes. The upper inside surface of a bubble tube is ground longitudinally to the arc of a given radius. The radius of the curve is known as the "radius of curvature of the bubble tube." The longer the radius the more sensitive the instrument is said to be. This means that the bubble in the tube responds more readily to any movement of the leveling screws or tangent screws. Length of the radius of curvature of bubble tubes varies widely, from 1 ft. for a hand level up to about 125 ft. in the best engineer's level. The radius of curvature for the plate bubbles on transits is from 20 to 40 ft. If a transit is to be used as a level the telescope bubble tube should have a radius of at least 60 ft.

The manufacturer chooses the midpoint of a bubble tube and marks off symmetrical units on either side of this zero point. These markings are made to aid the instrument man in telling when the bubble is accurately centered in the tube. The imaginary line which is tangent to the upper inside surface of the bubble tube at its zero point is known as the axis of the bubble tube.

Verniers.—Transits, alidades, clinometers, and level rods are equipped with verniers of one sort or another. A vernier is simply a device which allows a scale to be read more accurately than it could be read by estimation. The smallest unit that can be read with a vernier is known as its "least count." The least count of a vernier for either a circular or linear scale can be found by the formula: least count = L/N, where "L" is the value of the smallest division on the limb scale, and "N" is the number of divisions on the vernier.

In the illustration (Fig. 2) the limb, or lower, scale is divided into half-degree units, or 30′ units, while the vernier, or upper scale, is divided into 30 divisions, so ruled that 29 divisions on the limb are equal to 30 divisions on the vernier. (In some instruments 31 divisions are ruled on the vernier but the thirty-first is not counted; it aids greatly in the precise location of the coincidence of the 0 and 30-unit lines with any one of the 29 divisions on the limb scale). The least count is therefore 1/2° (or 30′) divided by 30, or 1′.

Example: The vernier index, A, of the instrument (Fig. 2) shows a value between 13° 00′ and 13° 30′ for a **counter clockwise** reading: further

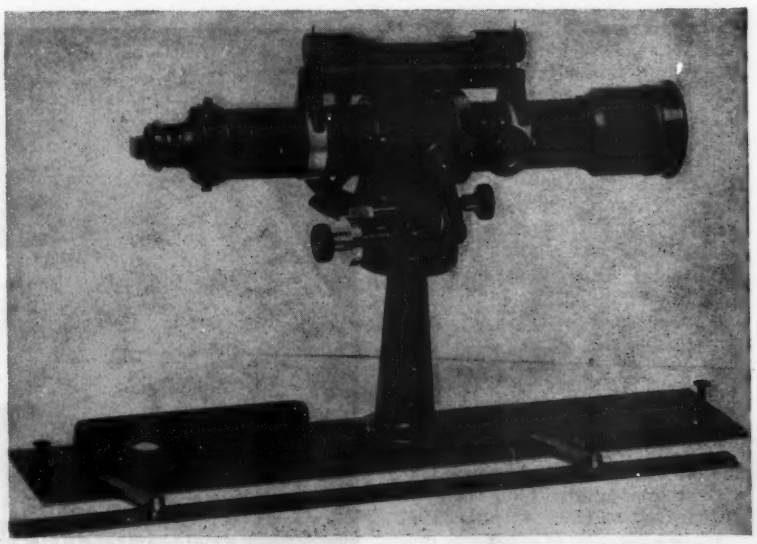


Fig. 1—The alidade sets on a "plane table" covered with heavy drawing paper. The map is graphically constructed on the table as each "shot" is made

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

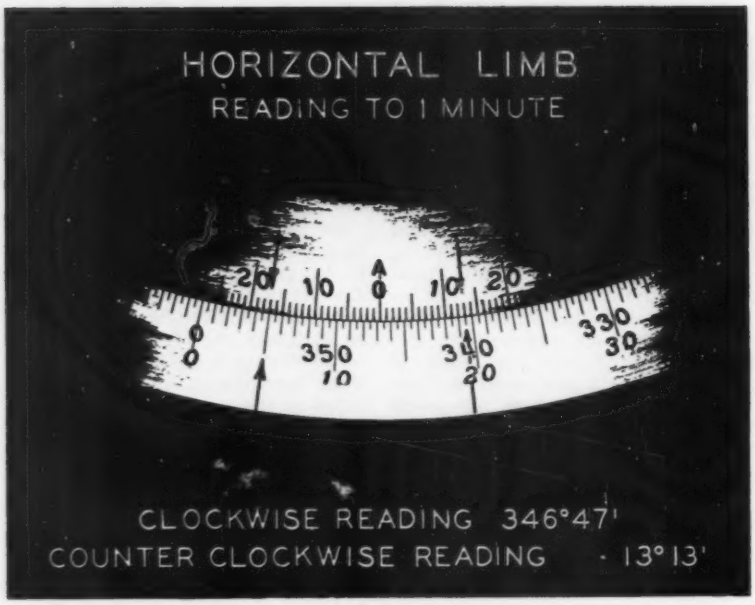


Fig. 2

inspection shows that the line at 13 units on the vernier is in perfect alignment with a line on the limb scale, then the correct reading is 13° 00′ plus 13′, or 13° 13′. Similarly for a **clockwise** reading the instrument (Fig. 2) indicates a reading between 346° 30′ and 347° 00′. The line at 17 units on the vernier is directly opposite a line on the limb. Hence, the correct reading is 346° 47′.

On some instruments the limb scale is subdivided into 15′ divisions, and the vernier is ruled so that 15 vernier subdivisions are equal to 14 divisions on the limb scale. The least count is therefore 1/4° (or 15′ divided by 15, or 1′ again. Where the index of the vernier falls between 32° 45′ and 33° 00′ and the twelfth line on the vernier is in coincidence with a line on the limb scale, the correct reading is 32° 45′ plus 32° 57′.

A common type of vernier is illustrated in Fig. 3. The limb scale is divided into one-third degree units, or 20′ units. The vernier is ruled so that 39 divisions on the limb scale are equal to 40 divisions on the vernier. The least count of such a vernier is 30″.

Example: In Fig. 3 the index, A, of the vernier falls between 130° 00′ and 130° 20′ for movement of the vernier to the right of the zero on the limb scale. If the line on the vernier numbered 9 was coincident with a line on the limb the reading would be 130° 09′ 00″; if the line numbered 10 on the vernier was coincident with a line on the limb the value would be 130° 10′ 00″. In Fig. 3 the shorter line on the vernier between the lines 9 and 10 is seen to be coincident with a line on the scale. The vernier therefore reads 130° 09′ 30″. For a movement of the index from right to left the vernier in the figure reads 49° 50′ 30″. Verniers of this type are used frequently on the horizontal limbs of ordinary transits. However, surveys of ordinary accuracy usually do not require that angles be read directly to 30 seconds.

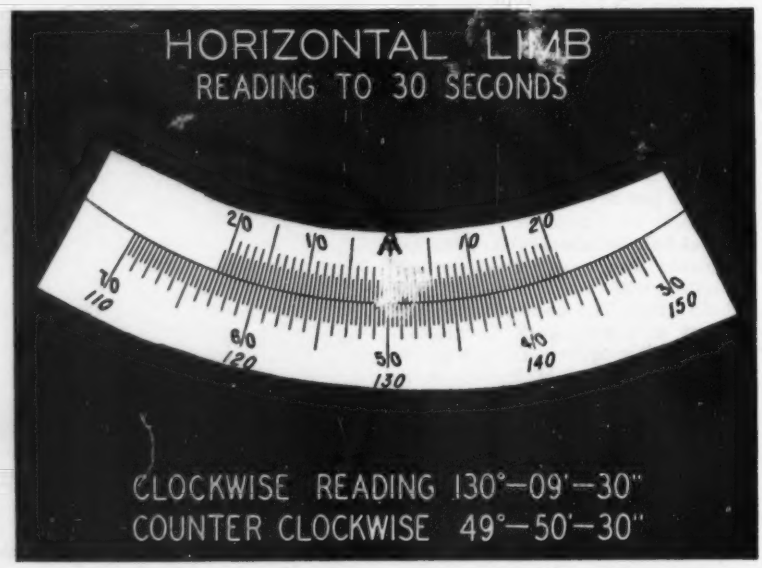
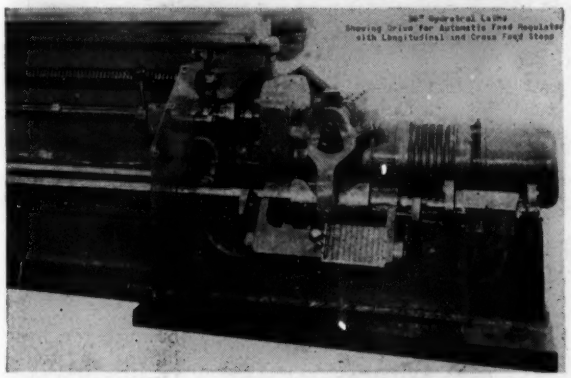


Fig. 3

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

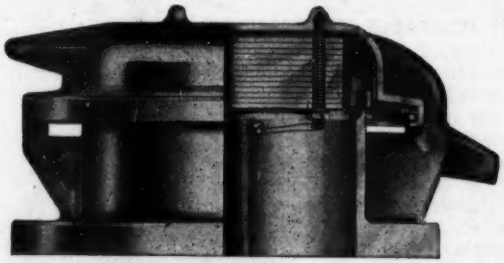
(1) AUTOMATIC TURRET FEED REGULATOR with automatic longitudinal and cross-feed stops is new lathe feature. Brings new turret face into the work area; indexes front and rear cross slide positioning stops; indexes longitudinal stops that may be used for position-



ing a cross-feed cut or as a longitudinal feed stop; automatically regulates rate of feed by six-position rotary cam. Does not interfere with operation of quick-change feed gear box. Electrically interlocked to prevent simultaneous application of power through both drives. *Lehman Machine Co.*

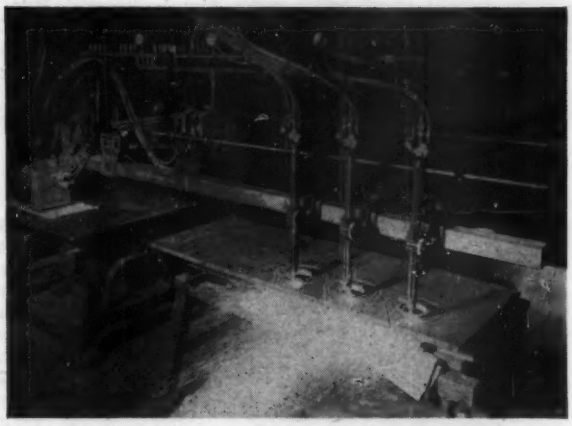
IT'S NEW CHECK IT

(2) NEW VERTICAL VENT VALVE embodies several improvements. The sealing medium is a flexible neoprene or synthetic-rubber gasket of patented "cantilever" design. Pressure in the tank is used to seal the valve tightly against leakage. When pressure in the tank builds up high enough to lift the valve cover (this occurs at the set pressure of the valve) the rising cover pulls the gasket from its tight mating with the body, and relieves pressure from the tank. When pressure in the tank drops below the valve setting the cover falls to rest upon supporting lugs and once more the cantilever gasket seals the valve tightly. *Black, Sivalls & Bryson, Inc.*



IT'S NEW CHECK IT

(3) NEW ELECTRONIC CONTROL for pantograph-type oxyacetylene cutting machines simplifies steel-cutting operations and makes intricate design cutting practical, eliminates expensive metal and wood templates and all other mechanical or manual auxiliary guiding devices. Cuts the most complicated shapes with great precision from quickly prepared outline drawings or silhouettes



of the desired piece. No limitations to the variety of designs which may be cut. Shapes are cut directly from a drawing with exacting precision. Human error and previous mechanical restrictions have been eliminated. Templates required are simple outline drawings or silhouettes. Consists of two units—tracing head and control box. Easily attached to any cutting machine in place of conventional equipment. *Air Reduction Sales Co.*

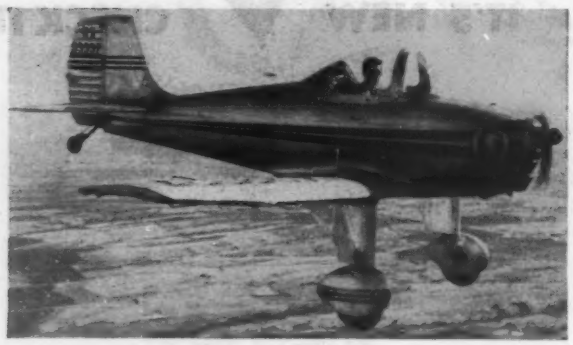
IT'S NEW CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

OIL AND GAS EQUIPMENT

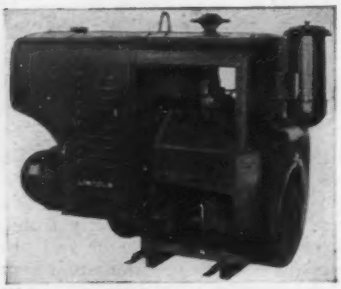
IT'S NEW ✓ CHECK IT



(4) NEW LONG-WING, ALL-METAL MONOPLANE designed to carry one person is powered by a four-cylinder, air-cooled engine of 65 hp. which gives top speed of more than 135 m.p.h. and a cruising speed of 122 m.p.h. At cruising speed the engine consumes only 4 gal. of gas per hour. With a speed-power ratio of 2 m.p.h. per horsepower, the new craft is believed to be the fastest in its class and has demonstrated high degree of controls at all speeds. Fuselage is of aluminum stressed-skin construction with few bulkheads. Has a fabric-covered, internally braced metal wing and metal-covered control surfaces. Bubble-type cockpit canopy and wing-root fillets are employed for maximum streamlining effect. The landing gear is fixed, with oleo shock struts. The plane's wingspread is 25 ft. and its over-all length is 17 ft. *Luscombe Airplane Corp.*

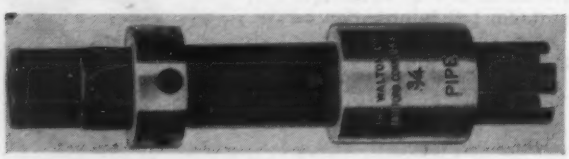
IT'S NEW ✓ CHECK IT

(5) NEW PORTABLE WELDER provides inexpensive, complete, lightweight portable unit for price normally paid for generator alone. The 200-amp. unit measures only 24 by 48 by 30 in. and has current range of 40 to 250 amp. Powered by 22-hp. four-cylinder air-cooled engine. *The Lincoln Electric Co.*

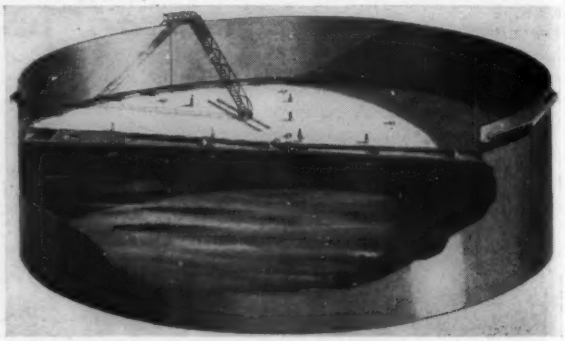


IT'S NEW ✓ CHECK IT

(6) TAP EXTRACTORS FOR PIPE TAPS. Designed especially for the accurate, quick, and easy removal of broken pipe-threading taps, a group of 10 new pipe-tap extractors have been added as stock sizes. These are immediately available for all sizes of pipe taps from ⅛ in. to 1 in. inclusive for both regular and interrupted thread styles. *The Walton Co.*



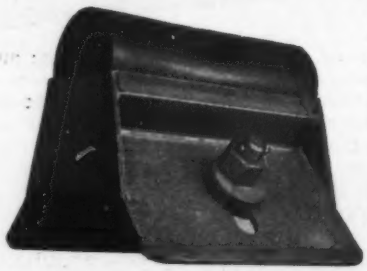
(7) AN IMPROVED FLOATING ROOF of double-deck construction has been developed for use on flat-bottom tanks storing volatile liquids. Double-deck construction insulates the liquid and practically eliminates all boiling, extending the range of products previously stored in floating-roof tanks. The bottom of the deck is sloped up toward the center and the roof is designed to vent



all air from beneath the deck. The top of the deck is smooth and slopes toward the drain located at the center. The Horton seal closes the space between the tank shell and the deck. A sealing ring forms a long sliding contact with the tank shell and is joined to the deck by a continuous gas-tight curtain. *Chicago Bridge & Iron Co.*

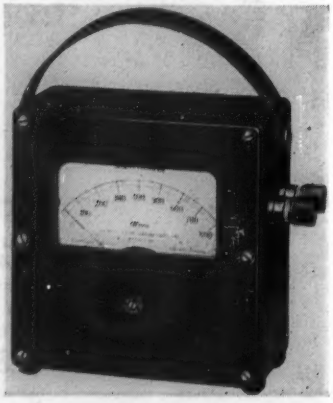
IT'S NEW ✓ CHECK IT

(8) TRAVELING BLOCK BUMPER. A shock-absorbing bumper for installation on top of traveling block. A thick cylinder of PBX absorbs the shock should the block be inadvertently pulled into crown. Especially important in the portable rig, where the driller is unable to see the crown block from his station. *Patterson-Ballagh Co.*



IT'S NEW ✓ CHECK IT

(9) PORTABLE PYROMETER. Compact, lightweight pyrometer mounted in magnetically shielded metal case, providing accurate temperature readings in shop and general industrial use as well as in the laboratory. Movement is double air gap type, with Alnico magnet. Available as a single circuit pyrometer with a choice of 10 scale ranges, 0-400 to 0-3,000 F, and as a double or triple range instrument built to order with scales as specified. Centigrade scales can be furnished. *Illinois Testing Laboratories, Inc.*



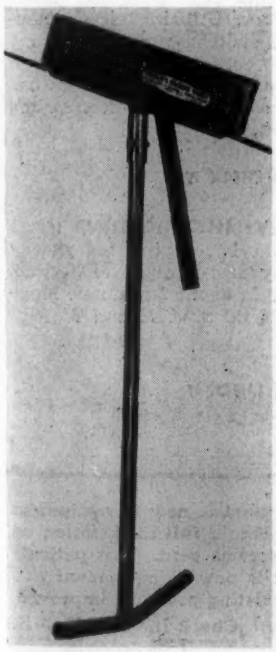
IT'S NEW ✓ CHECK IT

(10) MAGNESIUM ALLOY TYPE CEMENT RETAINER features the ultimate in easy drillability. Can be readily drilled up by using tubing, drill pipe, or cable tools. Can be used for short periods as a temporary bridge plug, but not recommended as a permanent bridge plug due to the chemical reaction of the well fluids on the magnesium. Equipped with two sets of annularly segmented cast iron slips having hardened wickers. These slips are nitrated and are so designed as to break up into small pieces when the retainer is drilled out. *Baker Oil Tools, Inc.*

IT'S NEW ✓ CHECK IT

(11) ALUMINUM PAINT USE INDICATOR. A new, handy, pocket-size aluminum paint indicator places at the finger tips everything one might wish to know about the exterior or interior application of aluminum paint. One setting of the indicator tells: how to prepare any given surface, how many square feet can be covered with a gallon of paint. Has two sides, one for interior, the other for exterior applications. *Crescent Bronze Powder Co.*

IT'S NEW ✓ CHECK IT



(12) ESCAPE MECHANISM used for sliding down guy lines from derricks or refinery towers. Has "T" bar saddle seat for quick straddling, and brake lever is so placed to be in hands of the operator at all times. Brake surfaces are covered with bronze to eliminate danger of flying sparks. Can be used on any lines from 1/8 to 3/8 in. in diameter. Weighs approximately 28 lb. *Charlie's Machine Works.*

IT'S NEW ✓ CHECK IT

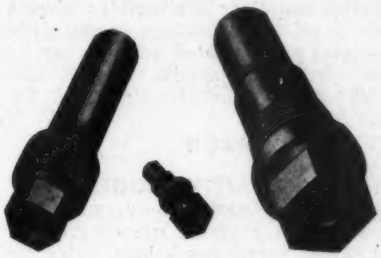
OIL AND GAS EQUIPMENT

IT'S NEW ✓ CHECK IT

(13) ELECTRIC CONNECTOR FOR LOW LEVEL SOUND, 2-3/32 in. length and maximum diameter of 5/8 in. Streamlined, it has rugged die-cast zinc shell and three 15-amp. silver-plated brass contacts in phenolic insert. Takes No. 14 B & S stranded wire and has ample voltage for sound applications. Easily adapted to geophysical equipment. *Cannon Electric Development Co.*

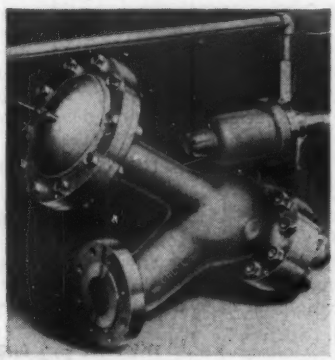
IT'S NEW ✓ CHECK IT

(14) FLOW BEANS gaged in increments of 10 per cent of flow rather than fractional sizes permit 60 sizes up to 1/2 in. and 31 sizes up to 1/8 in., as compared to 16 sizes of fractionally drilled beans up to 1/8 in. Control more accurately flow of oil or gas through positive chokes. *Thornhill-Craver Co., Inc.*



IT'S NEW ✓ CHECK IT

(15) NEW BACK-PRESSURE, RELIEF, AND STACK VALVE overcomes freezing. Free-flow characteristic attributed to an unusually straight flow resulting from a 30° S-pattern valve body design. Reduces wire-drawing and cutting action to the minimum. Capacity equivalent to double-seated globe valves, yet single-seated valve and pilot construction is employed to insure positive tight shutoff with no leakage or seepage to freeze. Packing glands or stuffing boxes are eliminated. Freely functions at flow line pressures, avoiding need for secondary pressure reductions. *Grove Regulator Co.*



IT'S NEW ✓ CHECK IT

TRADE LITERATURE

(16) ELECTRIC GAGING UNIT. Used to give remote indication of tank levels without the hazard of sending a man to the top of the tank. Using submerged motors

as the actuating devices, great accuracy and flexibility are attained. *Roach Equipment Manufacturing Co.*

IT'S NEW CHECK IT

(17) "INDUSTRIAL INSTRUMENTATION" is a new 16-page booklet covering indicators, recorders and controllers, mechanical, electrical, and electronic. This manufacturer's complete line of instruments is shown as well as accessories and spare parts. *The Foxboro Co.*

IT'S NEW CHECK IT

(18) OIL-FIELD TRANSPORTATION. An eight-page booklet shows how spudders are skidded from one location to another, and engines, mud pumps, and floors hauled into position. Shows relocation of derricks, building of roads and slush pits, in a photographically complete layout. Designed to show this manufacturer's equipment in its best light, it covers a great many of the difficult moving jobs common to the petroleum industry. *Caterpillar Tractor Co.*

IT'S NEW CHECK IT

(19) PREFABRICATED BUILDINGS. New broadside presents prefabricated steel buildings designed as airport hangars but adaptable to oil-field buildings or any other use to which an all-metal prefabricated building can be put. Broadside shows structural details, layouts, and existing structures pictorially. *Star Manufacturing Co.*

IT'S NEW CHECK IT

(20) "HELPFUL HINTS AND SAFETY SUGGESTIONS" is the title of a 64-page book covering the manufacture, uses, and precautions necessary to the use of grinding equipment. Grinding-wheel recommendations, rules for selection, definitions of grinding terms are included. *Macklin Co.*

IT'S NEW CHECK IT

(21) OIL-FIELD EQUIPMENT. New 48-page, multicolor catalog presents this old-line oil-well-equipment manufacturer's complete line. Divided into three sections, it covers well-head equipment, air-operated rotary slips, gas-lift equipment. Liberally illustrated with exploded views, cutaway drawings, it contains complete information, specifications, and design data. *McEvoy Co.*

IT'S NEW CHECK IT

(22) SELF-LOADING FLOATS. Six-page broadside, ring punched for handy filing, illustrates and gives specifications for this manufacturer's line of self-loading floats. All models and sizes are included and specifications of each are shown. *Hobbs Manufacturing Co.*

IT'S NEW CHECK IT

(23) SHAFT-SEAL. Two-color, 16-page bulletin entitled "The Shaft-Seal—The Answer to Your Stuffing Box Problems" contains graphic description of this new sealer. Shows cross-section and exploded views and pictures of typical shaft seal installations as well as performance records for a number of liquids. Should be of great interest to hydraulic engineers and users of centrifugal pumps. *Ingersoll-Rand Co.*

IT'S NEW CHECK IT

(24) EMULSION-TREATING EQUIPMENT. General catalog, divided into nine sections, covers this manufacturer's complete line of emulsion-treating equipment, including settling tanks, heaters, water knockouts, salt-water disposal, spare parts, and general information on treating equipment. This catalog has just been brought up to date and is well illustrated with photographs, cutaway drawings, graphs and charts, giving the operating characteristics, list prices, and specifications of this equipment. *National Tank Co.*

IT'S NEW CHECK IT

(25) COOLING-SYSTEM CLEANER. Twenty-page booklet describes the use of this manufacturer's solvents in cleaning cooling systems and all types of motors, processing tanks, coils, and condensers. Service records and corrective measures for various types of blocking and scaling are included. *The Process Solvent Co.*

IT'S NEW CHECK IT

(26) THREAD COMPOUNDS. Two new pamphlets compiled by old-line manufacturer of pipe-threading compounds cover the characteristics, quality, and composition of these oft-neglected but important adjuncts to pipe makeup. The various uses of thread compounds outside of direct-thread applications are included in one, while the second pamphlet covers the use of joint-sealing and antiseize compounds in refinery construction and maintenance. *I. H. Grancell Co.*

IT'S NEW CHECK IT

(27) REMOTE INDICATION OF LIQUID LEVELS, with illustrations, is the subject a four-page pamphlet issued by automatic-gage manufacturer. Utilizing either magnetic mercury or rotary-type switches, practically any motor can be used to operate the gage. Any number of receivers and likewise any number of transmitters can be installed on single panel with central office. *Nelson Automatic Gauge Co.*

IT'S NEW CHECK IT

(28) PIPE-CUTTING AND BEVELING MACHINE uses oxyacetylene torch to cut and bevel pipe for speedy welding. Adjustable to cut any degree of bevel desired, it cuts and bevels a 12-in. pipe in about 2 minutes. Made in four sizes to handle 4 to 26-in. pipe. *H and M Pipe Beveling Machine Co.*

IT'S NEW CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

REFINING

Socony-Vacuum Develops Oil Burner Modification

NEW YORK.—A modification for the pot-type burner using catalytic fuel oil, which reportedly results in greater efficiency and less sensitivity to the type of oil used, has been developed by the technical service laboratories of Socony-Vacuum Oil Co., Inc.

The company plans to cooperate with manufacturers of the pot-type burners in further development of the modification. In the modified burner liquid fuel is protected from the intense heat radiated from the flame by placing a metallic shield between the flame and the small pool of oil usually present on the bottom of the pot around the inlet. The vaporized fuel is allowed to premix thoroughly with some primary air under a reasonably cool temperature to permit partial oxidation by determining accurately the height of the shield and by placing an additional baffle above it.

Refinery Group Reports Lubricating Oil Supply

A 46-day supply of bright stock and a 21-day supply of viscous neutrals were held at the end of March by 13 companies manufacturing lubricating oil in the Mid-Continent area.

Summarizing lubricating oil operations of the companies, the Western Petroleum Refiners Association reported production of bright stock during the month as 255,866 bbl., and of viscous neutrals as 337,354 bbl. Domestic shipments were 255,111 bbl. bright stock, and 326,723 bbl. viscous neutrals. Shipments for exports totaled 1,050 bbl. bright stock, and 1,968 viscous neutrals. Inventories were 340,942 bbl. bright stock and 215,302 bbl. viscous neutrals.

For paraffin oils, production totaled 66,413 bbl., and inventories 67,508 bbl. For steam refined stock, 33,254 bbl. were produced with inventories at the end of the month of 32,172 bbl. For blended oil, production amounted to 350,857 bbl. and the inventory totaled 186,095 bbl.

Baytown Safety Contest Won by Butyl Division

HOUSTON.—The butyl division of Humble Oil & Refining Co.'s Baytown, Tex., plant is the first of three major divisions of the refinery to reach its safety goal.

Gordon L. Farned, plant superintendent, said the butyl division set a safety record of 700,000 work hours without loss of time because of accidents. A goal of 1,100,000 work hours for the main refinery, and 450,000 hours for the butadiene plant was set by safety officials in December 1945.

The contest was conducted by John W. Baldwin, safety supervisor, and L. J. Miller, refinery safety engineer and coordinator of safety at the Baytown plant.

German Work on Acetylene Described in U. S. Report

WASHINGTON.—A series of acetylene reactions worked out by German chemists are described in a report released by the office of the publication board, Department of Commerce. While the report deals primarily with the synthesis of butadiene by the Reppe process, investigators believe the information will be of interest to American producers of other organic chemicals.

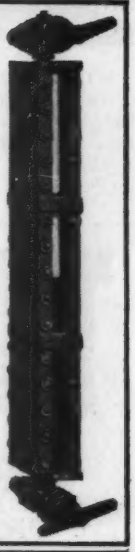
The report was prepared by investigators who studied German operations at Farben's Ludwigshafen plant. While certain steps in the Reppe process are similar to the hydrogenation and dehydration steps in the aldol process, the formaldehyde acetylene reaction is considered new. One reaction described may open new possibilities for chemical production. This was between acetylene and var-

OIL and GAS
BURNING EQUIPMENT
NATIONAL
AIROIL
BURNERS
1236 E. Sedgley Ave.
PHILADELPHIA 34, PENNA.

PENBERTHY
"TRANSPARENT"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Used to observe color and density of liquids under high pressures and/or temperatures. Construction exceptionally sturdy. Made of alloy temperature resisting steel, and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Instrument Engineer

Wanted by Eastern Engineering and Contracting Co.

Man wanted who has complete technical knowledge of theory of modern instruments in petroleum and chemical industries. He must be qualified to specify complete instrumentation for petroleum and chemical process units. Give educational background, experience, and salary desired. Write Box B-206.

The Oil and Gas Journal
Tulsa 1, Oklahoma

ious aldehydes with a copper acetylide catalyst. A German mechanical air foam solution for use in fire extinguishers, said by German industrial users to be the best available, is described in another report released by the publication board.

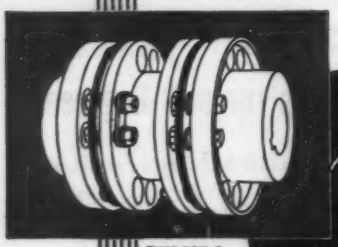
Superiority of Neoprene Shown in Du Pont Tests

WILMINGTON, Del.—The superiority of neoprene synthetic rubber to natural rubber in resisting deterioration under actual outdoor exposure is shown in 10-year tests, according to Du Pont Co.

Du Pont, which developed neoprene and produced it in small quantities before the war, said compositions of high quality neoprene and compounds of natural rubber were exposed under strain to the weather for 10 years and 7 months. Natural rubber cracked so extensively that it was unfit for service, while neoprene showed practically no signs of deterioration.

At the end of the period, neoprene retained 72 per cent of its original tensile strength and 85 per cent of its original elongation, the company said. The extended study of the synthetic confirmed results of prior accelerated tests. Neoprene is made mainly from acetylene gas. Government facilities have a capacity for producing 60,000 long tons of neoprene a year; private neoprene capacity, all Du Pont-owned, is 9,750 long tons.

THOMAS
Flexible COUPLINGS
FOR HOT OIL PUMP DRIVES or any other service where 100% dependability is demanded



THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!

The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

Write for Complete Engineering Catalog!

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

Refinery to Shut Down; Price Squeeze Cited

HAWLEY, Tex. — The 1,000 - bbl. daily capacity refinery of Moutray Oil Co. north of here this week was preparing to close down June 1 because of conditions which E. W. Moutray, the owner, described as making it impossible to operate without a loss.

Moutray cited a retail increase of 4 cents, 3 cents, and 10 cents per barrel in the price of crude without a corresponding increase in the price of products, increased cost of labor and other materials, and the shortage of lead. This, he said, is "causing us to close the plant as of June 1. It is being placed in a standby condition ready to operate when conditions change."

The refinery, which opened in 1930, employes about 30 persons with a payroll of about $5,000 monthly. It has been processing about 24,000 bbl. of crude a month.

Socony-Vacuum Buys Plant

NEW YORK.—Socony-Vacuum Oil Co., Inc., has purchased the butane-butylene extraction plant at East Chicago, Ind., from War Assets Administration. The plant, built by the Government during the war for use in manufacturing high-octane gasoline, has been idle since the close of the war.

British-American Plans Refining Improvements

TORONTO, Ont.—Increase of 50 per cent in the refining capacity of British-American Oil Co. in the next few years was forecast by President W. K. Whiteford at the annual meeting.

New installations will be designed to produce not only high-octane gasoline but new and different fuels and lubricants for entirely different types of prime movers. The company is this year installing additional equipment at Calgary and Moose Jaw refineries to permit utilization of heavy gravity crude oils produced in western Canada and the production of a wider range of asphalt products.

Purchase of the Union Oil Co. of Canada has given British-American 318 additional outlets and 54 bulk plants, mostly in British Columbia, as well as two deep water terminals.

PIPE LINES

Colorado Interstate Plans Hugoton-Denver Gas Line

Colorado Interstate Pipe Line Co. has announced through President Robert W. Hendee, of Colorado Springs, that the company will build a 16-in. pipe line from the Hugoton field in southwestern Kansas to Denver to supplement the gas supply now provided by its 340-mile line from the Texas Panhandle.

Orders have been placed for the pipe. Estimated cost is $15,000,000. Plans provide for completion and in use by winter of 1947-48. The line is designed to have an operating pressure of 1,000 psi. The company sells gas at wholesale to the Public Service Co. of Colorado, which serves cities and towns in central and northern Colorado, and Cheyenne, Wyo., and industrial concerns. The present line from Amarillo has been operated at capacity for several years and the new line is intended to provide additional supplies for the next 10 years. Public Service Co. will spend between $2,500,000 and $3,000,000 for additional facilities. The latter company is expected to apply to Denver for a renewal of its franchise at an early date.

Rehearing Refused by SEC On Minnesota Line Sale

PHILADELPHIA.—Northern Natural Gas Co. and its subsidiary, Peoples Natural Gas Co., have failed in their efforts to gain a Securities and Exchange Commission rehearing of its decision refusing approval of a proposed sale by Interstate Power Co. to Peoples of a pipe line in Waseca, Minn., for a base price of $162,500 in cash.

In denying the sale March 28, the commission held that competitive conditions had not been maintained and in rejecting the petition for a rehearing, the commission held that the petition "raises no substantial question not previously considered" by the commission.

Minnesota Valley Natural Gas Co. opposed the sale on the ground that Interstate did not maintain competitive conditions in its negotiations for the sale.

Coal Organization Opposes Use of Big-Inch for Gas

HARRISBURG, Pa.—The Pennsylvania anthracite committee, set up originally by Former Gov. Arthur H. James to aid the hard coal industry, last week opposed a proposal to use the big-inch pipe line to bring natural gas from Texas to eastern seaboard states.

D. L. Corgan, committee secretary, said the agency, composed of representatives of operators, miners, and the commonwealth, asked the Federal Power Commission in Washington for permission to intervene in a proposal to sell the pipe line to private interests.

Corgan said the anthracite and bituminous coal industries are both opposed to the proposal because it would be used to bring 275,000,000 cu. ft. of gas into this area to compete with coal.

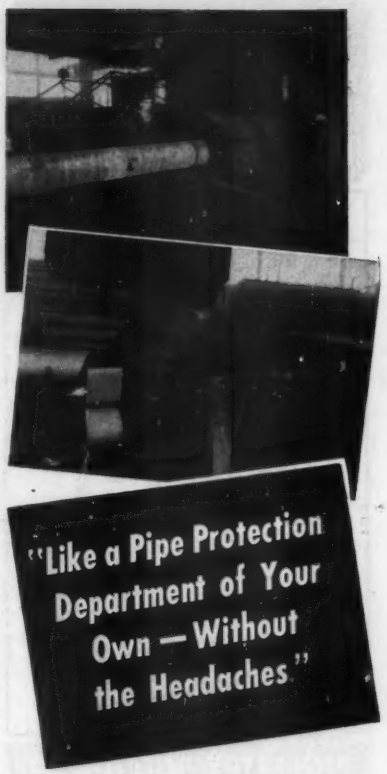
He estimated that between 8,000 to 10,000 miners would be thrown out of work if all of the natural gas displaced coal in eastern states. Big Inch Gas, Inc., seeks to buy the pipe line from the federal Government. It was built during the war to carry oil to

C. S. FOREMAN COMPANY

General Contractors

PIPE LINES

217 Railway Exchange Building
Kansas City 6, Missouri



When you give Pipe Line Service a job of coating and wrapping pipe, you have the close cooperation that you'd expect only from a department of your own, without any of the headaches of equipment and personnel.

These experienced pipe protection specialists offer you a complete service at six strategically located plants that relieves you of all responsibility. You simply select the specification you want and Pipe Line Service does the rest.

Find out today how much *more* Pipe Line Service gives you for your pipe protection dollar.

COMPLETE SERVICE
Through Strategically Located Plants

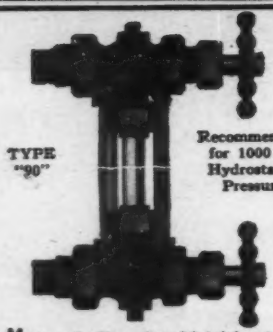
- Coating and Wrapping
  At the Mill
  At Yard or Railhead
  Over the Ditch
- Pipe Cleaning Service
- Pipe Storage
- Pipe Delivery

PIPE LINE SERVICE CORPORATION

PIONEERS IN STEEL PIPE PROTECTION

General Offices and Plant • FRANKLIN PARK, ILL.
Plants at Glenwillard, Pa. • Longview, Texas
Corpus Christi, Texas • Harvey, Louisiana

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



TYPE "90"

Recommended for 1000 lb Hydrostatic Pressure

Made of Chromium-Molybdenum alloy temperature resisting steel, extra heavy throughout and stainless steel trimmed. Positive automatic shut-off; stainless steel balls shut off the flow of liquid if glass breaks. Regrinding removable seats, heavy duty stuffing boxes, union connections. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

WRITE FOR LATEST INFORMATION

Improved LCN Pig
Assures Maximum Gas Thru-put

Type LCN Pipe Line Pig

- For internal cleaning of natural gas transmission lines.
- Sizes 16 to 26-inch, inclusive.
- Rugged, light-weight steel construction.
- High velocity gas, jetting through enlarged by-pass, sweeps debris ahead of Pig.
- Tough rubber scraper cups and tempered steel wire brushes scour pipe walls thoroughly.

Types BC and SCN Pigs available for cleaning gas lines smaller than 16-inch.

THE PIG WITH THE POKE CLEANS PIPE LINES
T. D. WILLIAMSON, Inc.
TULSA, OKLAHOMA

PIPE-LINE PERSONALITIES

JAMES P. NEILL literally started at the bottom of the ladder in the pipe-line business.

Over a period of nearly 20 years, he has risen from a pick-and-shovel ditch-digging job to general superintendency of a major pipe line contracting firm.

Neill went to work in the pipe line business in 1927. After several jobs, he became division engineer for Ford, Bacon & Davis, Inc., during construction of Southern Natural Gas Co.'s system.

On completion of this job, he joined Southern Natural Gas and served with the company for 15 years, beginning as district foreman, later becoming district superintendent and, in 1936, general superintendent of pipe lines. In this capacity he was in charge of all operations, maintenance and construction for the company.

In October 1944 Neill resigned to join H. C. Price Co., Bartlesville, Okla., where he is now general superintendent. A native of Pennsylvania, he was educated at Stanford University.

the Atlantic seaboard. It would transmit natural gas from the East Texas oil fields to Pennsylvania, New Jersey and Delaware for sale to eastern consumers.

Mississippi River Fuel Plans $11,574,000 Program

WASHINGTON.—The Federal Power Commission announces the Mississippi River Fuel Corp., St. Louis, Mo., has requested authority to enlarge its natural gas transmission system in Louisiana, Arkansas, Missouri, and Illinois.

The commission said the company proposed to spend $11,574,000 on new facilities to more than triple the capacity of its system to a total of 183,000,000 cu. ft. daily. The company wants to start construction by September and expects to complete it in time to meet peak requirements in January and February.

Last winter, the company said, it was necessary to curtail industrial sales to protect domestic customers.

Wisconsin Group Supports Proposed New Gas Line

DETROIT.—Wisconsin public utilities officials last week gave support to a proposal to build a new natural gas pipe line from Texas fields to serve Michigan and Wisconsin communities.

They appeared at a hearing of the Federal Power Commission on the application of the newly organized Michigan - Wisconsin Pipe Line Co. for authorization to construct the line.

The new company is a subsidiary of the Michigan Consolidated Gas Co. which now is furnished gas by the Panhandle Eastern Co.

WHEN YOU WANT The Best IN PIPELINE CONSTRUCTION

OKLAHOMA CONTRACTING COMPANY

DALLAS TEXAS

SOUTH AMERICA
APARTADO 1085
CARACAS, VENEZUELA

Natural Gas

Boost in Louisiana Gas Tax Meets Opposition

BATON ROUGE, La.—The proposal of P. A. Frye, Louisiana natural gas conservation director, to hike the state's natural gas tax from ½ to 3 cents ran into considerable opposition here last week in a hearing before the State Revenue Code Commission.

Representatives of the natural gas industry, augmented by spokesmen for various manufacturers and industrial interests, vigorously opposed the scheme on grounds it would discourage expansion of Louisiana industry and that taxes on the resource already are high.

Frye is pushing the proposal as a means of conserving gas and curbing additional export to states with supplies of coal. Scott Wilkinson, Shreveport attorney appearing for the Louisiana natural gas committee, told the commission the total of all taxes on the gas industry in Louisiana in 1944 was 0.89 cent per 1,000 cu. ft., almost four times that in Texas.

In 1945, he said, pipe line companies sold 230,000,000,000 cu. ft. of gas in Louisiana at an average price of 8.65 cents per 1,000 cu. ft. "These companies cannot sell gas at the city gates of New Orleans, Baton Rouge, Shreveport, Monroe, Alexandria, and Lake Charles, nor to manufacturers within the state at a price of 8.65 cents per 1,000 cu. ft. if the well-side cost were increased 2½ cents per 1,000 cu. ft. by means of an increased gas gathering tax," he added. "The tax must be absorbed by every consumer in the state of Louisiana."

Wilkinson said Frye's "ill-considered" suggestion that pipe lines could absorb the tax for domestic consumers "ignores the fact that the only spread for the pipe line company is the difference between the well-side cost and the city gate price, which, after payment of operating expenses, is less than the proposed 3-cent gathering tax."

Earlier in the special prelegislative hearing, Frye told the commission that Louisiana ranks second in natural gas production but fifth in value realized from production at the wellhead.

Lacy Reported Planning Another Carthage Test

MARSHALL, Tex.—Construction of another natural gas processing plant in the Carthage field of Panola County is indicated in reports Roger Lacy, Longview, is discussing future gas commitments with other producers in the southeast part of the field.

Lacy has considerable production in the huge gas field and is now building, with Lone Star Producing Co., a processing plant on the north side of the field. It is reported preliminary plans provide for another 100,000,000-cu. ft. daily capacity plant in the southeast section of the field.

Straight Natural Gas Planned in Washington

WASHINGTON. — A vast program of converting District of Columbia service to natural gas, not expected to finally complete until October 1947 has been started by Washington Gas Light Co.

Marcy L. Sperry, company president, announced filing of applications with the Public Service Commission of Maryland and the Virginia Corporation Commission as the first step in the program which will include tapping the Texas-West Virginia pipe line.

Most Washington suburban areas are due to get straight natural gas before the 1946-47 heating season. Sperry pointed out adjustments must be made on appliances of more than 250,000 consumers. Washington consumers now use a mixture of natural gas from the Appalachian area and manufactured gas. In the changeover, the company will retain some of its production facilities to assure meeting peak demands and for emergency use. An application similar to the ones filed with the Maryland and Virginia agencies will later be made with the Public Utilities Commission of the District of Columbia.

Court Affirms Lowering Cities Service Gas Rates

DENVER. — A reduction of rates charged by Cities Service Gas Co. for pipe line movement from Texas and Oklahoma to Kansas City was affirmed here last week by the Tenth United States Circuit Court of Appeals.

The court upheld a Federal Power Commission order lowering the charges. The order required a rate reduction not less than $4,445,871 below 1941 operating revenue of $12,764,651.

Natural Gasoline

Shell's Sheridan Cycling Plant Formally Opened

HOUSTON. — A new gas cycling plant, representing the first venture of Shell Oil Co., Inc., in the cycling field, was formally dedicated last week by company officials at Sheridan, Colorado County, Texas.

The Sheridan plant was completed and put into operation last August. It is located in the center of the Sheridan gas field, discovered in 1940. Two important deposits of wet gas were found, one at 9,300 ft. and other at 10,200 ft. Most of the field's nearly 20 producing wells are dually completed.

The plant, by absorption and fractionation processes, takes from wet gas such hydrocarbons as butane and propane, isobutane, natural gasoline, and distillate (fuel oil base stock). The remaining dry gas is injected at pressures of over 4,000 psi. back into the producing formations to save the gas until a market for it exists and to help keep up the pressure of the field.

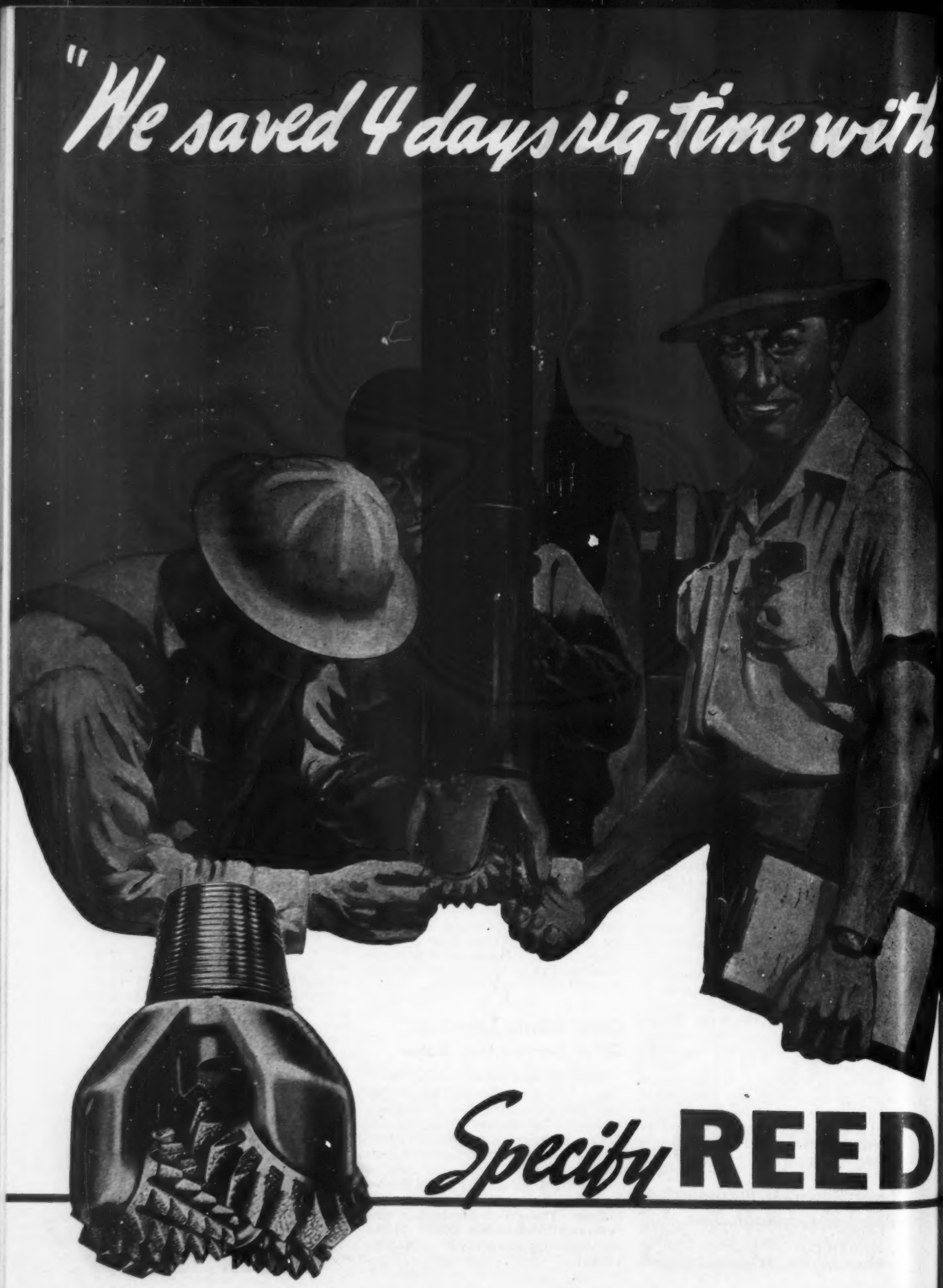
Shell's new plant can process 100,000,000 cu. ft. of gas per day and produce from it 6,750 bbl. of propane, butane, isobutane, isopentane, natural gasoline and distillate. These products are loaded into tank cars at the plant's 42-car loading rack and are shipped chiefly to the Shell refinery at Houston. At present, about 30 tank car loads a day leave for the refinery.

Gas cycling, T. R. Goebel, manager of Shell's gas-gasoline department, pointed out to those present at the dedication, is a striking manifestation of modern oil field production practice.

In recent years, Goebel added, conservation laws wisely required that condensate well gas either be put to useful purposes or returned to the ground after the desired hydrocarbons had been removed. However, return to the ground through injection wells such as those at Sheridan was not possible until comparatively recently as injection pressures of 4,000 psi. or more were not considered feasible. "We use what we can," said Goebel, "and what we can't, we save."

Under the Sheridan pooling arrangements, gas well revenue goes not only to Shell but also the Lone Star Producing Co., Tide Water Associated Oil Co., British - American Oil Co., Barnsdall Oil Co., and numerous royalty owners.

The plant was designed and built by Petroleum Engineering, Inc., Houston.


"We saved 4 days rig-time with
Specify REED

REED ROCK BITS
and Lighter Drilling Weights

. . . and also saved an appreciable amount of money on rig maintenance costs."

AN oil company engineer recently made a survey on 34 rigs in Oklahoma and found that the rigs using light drilling weights (18,000 lbs. or less) reached total depth in 4 days less time than rigs using heavy drilling weights (36,000 lbs. or more).

This represents a very worth while saving to the operator, not only in rig time, but in preventing excessive wear and strain on rig equipment all the way down.

Reed Rock Bits are designed to drill efficiently and safely with heavy drilling weights and high rotary speeds. **However, the inherent characteristics of the Reed cross-roller principle of design permit faster drilling with lighter weights.**

REED ROLLER BIT CO.
HOUSTON 1, TEXAS

Specify the

REED "T"
. . . for soft formations, such as shale, salt, red beds, unconsolidated sands and soft limestones.

REED "2T"
. . . for soft formations interspersed with streaks of abrasive sands.

REED "M"
. . . for medium hard formations, such as chalk, anhydrite, gypsum, medium hard shale and some of the softer lime formations.

REED "HM"
. . . for medium hard drilling where the formations do not contain an appreciable amount of abrasive material, such as medium hard and abrasive limestones.

REED "2HM"
. . . for medium hard drilling where abrasive materials are encountered, such as medium hard abrasive limestones, etc.

REED "2H"
. . . for slightly harder formations than those recommended for the "2HM", such as the hard dense limestones, abrasive limestones and sands.

REED "2"
. . . for medium hard formations which chip easily, such as: anhydrite, hard lime rock, hard shale, etc.

REED "2C"
. . . for drilling the very hard and abrasive formations, such as chert, hard lime and the dense, abrasive sands.

D ROCK BITS
Unitized for Greater Strength!

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 4, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	31	15	2	*14	53,315	532	409	0	0	0	0	0	0	0	0	0	0
Pennsylvania	68	36	3	†29	100,162	1,351	1,233	0	0	0	0	0	0	0	0	0	0
West Virginia	18	1	14	3	48,426	240	267	0	0	0	0	0	0	0	0	0	0
Ohio	21	6	10	5	61,748	373	259	0	0	1	1	2	2	0	9	13	24
Indiana	6	3	0	3	13,585	104	51	0	0	0	0	0	1	0	0	7	8
Kentucky	4	1	1	2	7,416	145	119	0	0	0	0	0	2	0	0	14	16
Illinois	52	30	0	22	129,253	707	510	1	0	0	6	7	15	0	0	121	136
Michigan	20	6	3	11	45,430	231	244	2	0	0	5	7	8	0	0	75	83
Kansas	32	20	2	10	104,633	655	511	1	0	0	3	4	9	0	3	79	91
Neb., Mo., Iowa	2	0	0	2	4,783	7	12	0	0	0	2	2	0	0	0	4	4
Oklahoma	43	29	2	‡12	118,833	793	778	2	0	0	1	3	25	0	10	105	140
Texas	171	93	6	72	729,292	2,686	2,434	5	2	1	24	32	67	13	9	402	491
North Central	67	24	1	§42	170,794	928	689	0	0	0	9	9	20	0	0	158	178
West	31	28	0	3	146,369	568	647	3	0	0	2	5	17	0	0	61	78
Panhandle	5	4	0	1	15,452	127	201	0	0	0	0	0	0	0	0	4	4
Eastern	14	10	1	3	64,622	252	108	0	0	0	2	2	6	0	1	33	40
Gulf Coast	44	25	3	16	291,943	616	563	2	2	0	7	11	18	11	4	83	116
Southwest	10	2	1	7	40,112	195	226	0	0	1	4	5	6	2	4	63	75
Louisiana	19	14	0	5	116,935	423	319	1	0	0	0	1	23	5	3	57	88
Northern	11	9	0	2	49,569	217	102	1	0	0	0	1	4	0	0	29	33
Southern	8	5	0	3	67,366	206	217	0	0	0	0	0	19	5	3	28	55
Arkansas	7	6	0	1	33,291	65	50	0	0	0	1	1	2	0	0	8	10
Mississippi	5	3	0	2	44,106	82	116	0	0	0	2	2	1	0	1	23	25
Southeastern states	1	0	0	1	4,976	15	12	0	0	0	1	1	0	0	0	14	14
Montana	6	3	0	3	21,946	85	100	0	0	0	3	3	4	0	0	7	11
Wyoming	3	3	0	0	13,151	57	72	0	0	0	0	0	6	0	3	19	28
Colorado	2	2	0	0	19,134	40	12	1	0	0	0	1	2	0	0	5	7
New Mexico	4	3	0	1	9,599	127	171	0	0	0	0	0	2	0	0	14	16
California	32	27	1	4	137,131	617	795	0	0	0	3	3	4	0	2	75	81
Utah	0	0	0	0	0	2	2	0	0	0	0	0	1	0	0	1	2
Total United States	547	301	44	202	1,817,145	9,337	8,476	13	2	2	52	69	174	18	40	1,043	1,275
Total previous week	531	307	47	177	1,762,566	8,790	8,003	16	2	1	57	76	161	16	38	991	1,206
Total May 5, 1945	473	242	54	177	1,691,307	8,476	6,539	7	0	1	73	81	195	6	43	1,096	1,340

Service wells included: *14, †27, ‡6, §2.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.125-6.375	5.25-5.625
Texas Gulf Coast	6.375	5.625
New York Harbor	7.375	6.375
California		6.00-6.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	2.750	3.300
N. Texas (f.o.b. plant)	2.250	2.700
N. Louisiana (f.o.b. plant)	2.625	3.150
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl	
East Texas	$1.35
Conroe	1.53
Tepetate, Louisiana, avg. grav.	1.30
Illinois Basin	1.47
Pecos County, Texas	1.05
Bradford, Pennsylvania	3.10
Van, Van Zandt County, Texas	1.15

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.90	....	....	....
19-19.9	.94	....	$1.16	$0.80
20-20.9	.98	$0.95	1.18	.82
21-21.9	1.02	.97	1.20	.84
22-22.9	1.06	.99	1.22	.86
23-23.9	1.10	1.01	1.24	.88
24-24.9	1.13	1.03	1.26	.90
25-25.9	1.17	1.05	1.28	.92
26-26.9	1.21	1.07	1.30	.94
27-27.9	1.25	1.09	1.32	.96
28-28.9	1.28	1.11	1.34	.96
29-29.9	1.30	1.13	1.36	1.00
30-30.9	1.33	1.15	1.38	1.02
31-31.9	....	1.17	1.40	1.04
32-32.9	....	1.19	1.42	1.06
33-33.9	....	1.21	1.44	1.08
34-34.9	....	1.23	1.46	1.10
35-35.9	....	1.25	1.48	1.12
36-36.9	....	1.27	1.50	1.14
37-37.9	....	1.29	1.52	1.16
38-38.9	....	1.31	1.54	1.18
39-39.9	....	1.33	1.56	1.20
40 and above	....	1.35	1.58	1.22

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended April 27, 1946

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks— Gasoline	Distillate	Residual
East Coast	744	23,102	10,036	6,669
Appalachian	154	3,949	521	436
Ill., Ind., Ky.	770	22,221	3,917	3,098
Okla., Kan., Mo.	363	8,700	1,660	1,090
Inland Texas	206	3,044	321	747
Tex. Gulf Cst.	1,144	14,871	4,988	4,382
La. Gulf Cst.	332	3,946	1,552	1,125
N. La., Ark.	54	1,898	449	219
Rocky Mtn.	126	2,375	422	678
California	792	15,525	6,600	20,965
Total 4-27-46	4,685	99,631	30,466	39,404
Total 4-20-46	4,789	101,059	30,284	38,124
Total 4-28-45	4,815	91,981	28,802	39,891

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
April 27, 1946	224,443,000
April 20, 1946	221,689,000
April 28, 1945	223,474,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	May 4 crude oil	Bureau of Mines May demand	April 27 crude oil
Alabama	1,050	700	1,150
Arkansas	77,950	79,000	77,200
California	860,500	840,000	858,250
Colorado	28,180	23,000	27,820
Eastern	66,000	62,900	64,750
Florida	250	200	100
Illinois	212,100	204,000	209,300
Indiana	19,250	16,400	19,250
Kansas	244,650	252,000	257,350
Kentucky	31,150	30,000	30,700
Louisiana	385,150	380,000	372,950
North Louisiana	85,200	.....	86,150
South Louisiana	299,950	.....	286,800
Michigan	46,042	46,000	44,780
Mississippi	57,050	53,000	55,200
Montana	23,910	22,000	23,920
Nebraska	750	800	750
New Mexico	95,300	99,000	95,300
Oklahoma	363,700	370,000	387,150
Texas	2,131,900	2,050,000	2,054,600
East Texas	368,800	.....	372,000
East Central Texas	145,200	.....	139,700
North Central Texas	165,000	.....	158,700
Texas Panhandle	83,000	.....	82,000
West Texas	521,200	.....	495,000
Southwest Texas	334,900	.....	326,500
Texas Gulf Coast	493,800	.....	480,700
Wyoming	102,570	97,000	106,230
Total United States	4,747,452	4,626,000	4,666,750

Change from previous week, up 80,702

Total production January 1-May 4 ..... 577,398,339 bbl.

Same period last year ..... 590,587,400 bbl.

CRUDE-OIL STOCKS 224,443,000 bbl. as of April 27—up 2,754,000 bbl. One year ago 223,474,000 bbl.

GASOLINE STOCKS 99,631,000 bbl. as of April 27—down 1,428,000 bbl. One year ago 91,981,000 bbl.

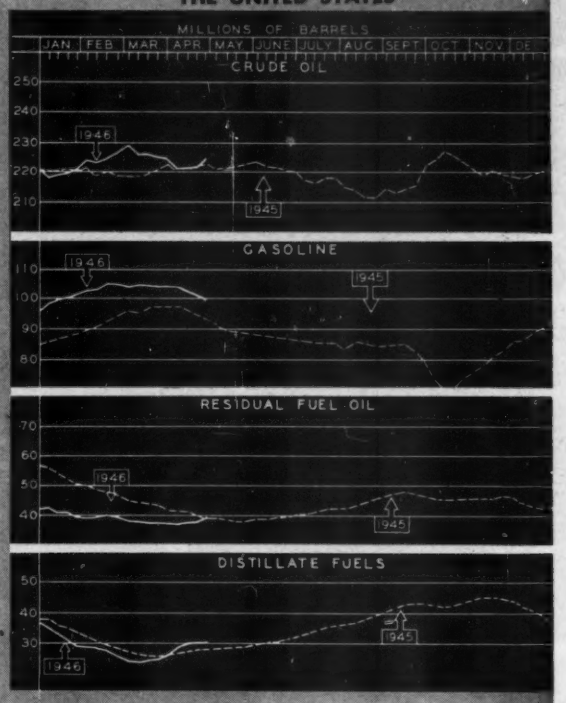
RESIDUAL FUEL-OIL STOCKS 39,404,000 bbl. as of April 27—up 1,280,000 bbl. One year ago 39,891,000 bbl.

GAS OIL AND DISTILLATE STOCKS 30,466,000 bbl. as of April 27—up 182,000 bbl. One year ago 28,802,000 bbl.

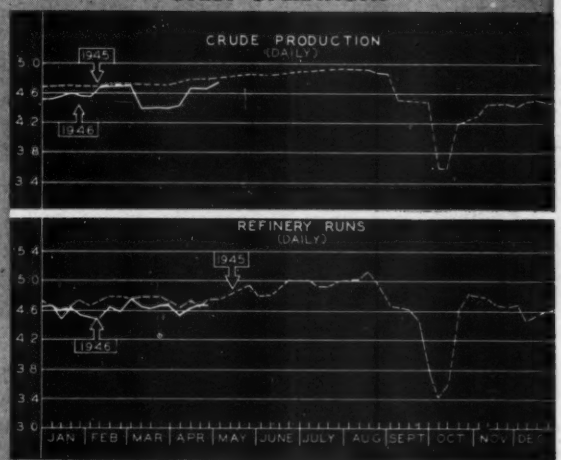
CRUDE-OIL PRODUCTION 4,747,452 bbl. as of May 4—up 80,702 bbl. One year ago 4,812,000 bbl.

REFINERY RUNS 4,685,000 bbl. daily week ended April 27—down 104,000 bbl. One year ago 4,815,000 bbl.

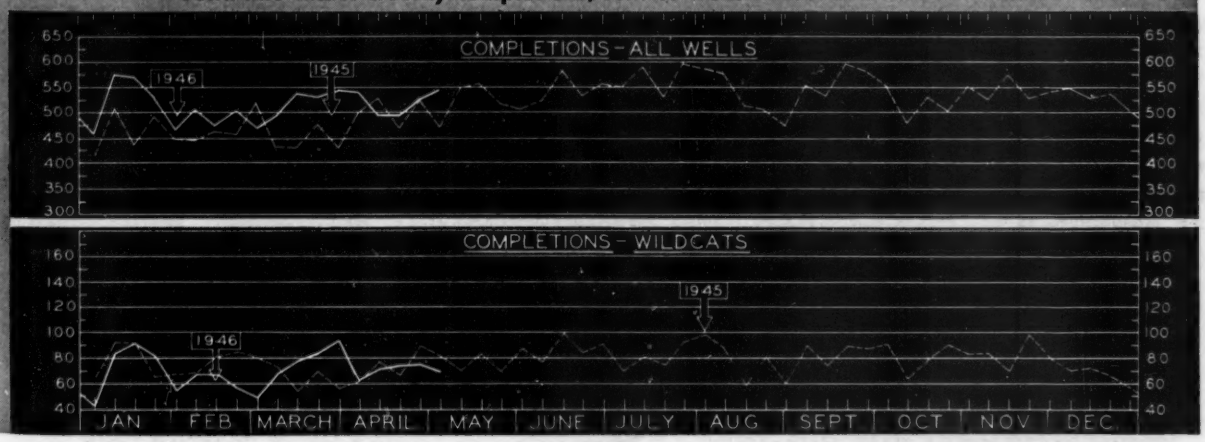
OIL STOCKS IN THE UNITED STATES

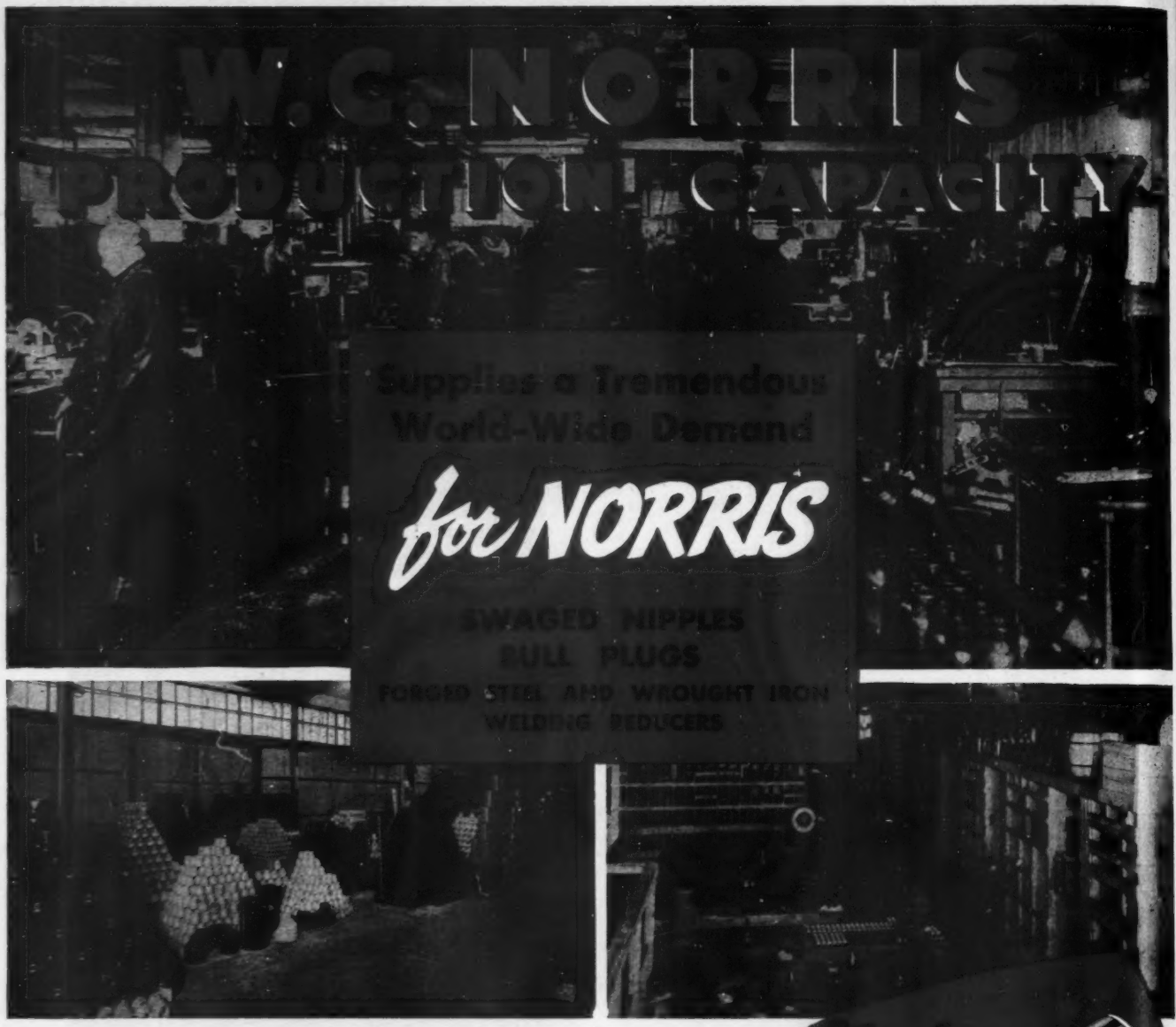


DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included





Despite an unprecedented demand on our production capacity in the manufacture of vital materiel of war, NORRIS Production capacity has been steadily increased until today, you need not accept less than NORRIS QUALITY in Swaged Nipples, Bull Plugs and Forged Steel Welding Reducers. For over half a century the name W. C. NORRIS and QUALITY have been synonymous in the manufacture of oil tools. Pioneering the exclusive NORRISIZING treatment for the elimination of rust and corrosion to prevent galling and seizing of threads, NORRIS Swaged Nipples, and Bull Plugs remain bright and new throughout their useful life at no extra cost over ordinary painted finishes. Be sure they're NORRIS—look for the label, then you can forget them. See your supply store. Send for descriptive Bulletin No. 31.

EXPERIENCE
Building Oil Tools
SINCE 1882

W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

BRANCHES
HOUSTON, KILGORE, ODESSA, TEXAS. SALEM, ILLINOIS
503 CONTINENTAL BUILDING, DALLAS, TEXAS

EXPORT OFFICE
ROOM 1940, 30 ROCKEFELLER PLAZA
NEW YORK CITY

Exploration and Drilling

Florida Chances Improve

PROSPECTS for a good oil field in Florida took on a much brighter aspect as Humble Oil & Refining Co. 6 Gulf Coast Realty, SW NE 19-48s-30e, in the Sunniland field, Collier County, on test was officially reported flowing 254 bbl. of 25.6° oil in 24 hours. Later reports indicate that the well may be better than that, possibly a 600-bbl. well as it stands.

This is Humble's third successful well, in an expensive pioneering exploration venture. The first well would not flow, the second flowed a little oil, but was completed as a pumper. The first is in 29-48s-30e, the second is 8,000 ft. north of the first, in 20-48s-30e, and the latest well is east of the second. The two producers have an accumulated production of about 60,000 bbl. as of May 1, and both are pumping a substantial volume of water with their oil.

The present well was drill-stem tested in open hole below 7-in. casing set at 11,558 ft., to 11,578 ft. total depth. It started flowing in about 2 hours after the tool was opened, producing 254 bbl. of 25.6° oil in 24 hours through a 5/32-in. top choke and a 3/16-in. bottom choke, with a flowing pressure of 335 psi. and gas-oil ratio of only 76 cu. ft.

From data available it does not appear that the third producer is much, if any, higher than the second, and both seem to have the pay about 40 ft. higher than the discovery. However, the gravity of the oil in the latest well is about 6° higher than the first oil recovered in either of the other producers. It may be that both porosity and gravity are increasing in the direction of the latest test. The pressure and gas-oil ratio are both low for depth, but of course are better than in the other two producers. The combination of heavy gravity, depth, and low gas-oil ratio, makes it difficult to estimate what the bottom-hole pressure may be, although it appears definitely below normal for depth.

The pay zone here is part of the Lower Cretaceous, which in this locality consists of about 5,000 ft. of limestones and evaporates. Locally, and probably regionally, there is an important unconformity between the Lower and Upper Cretaceous, as northward upward the Florida Peninsula, along the Ocala arch, this 5,000-ft. wedge of Lower Cretaceous thins out until it disappears.

The amount of structural relief appears to be rather small. Hence it may well be that the volume of porosity, fracturing, or solution cavities, will determine whether big production can be established, and on what part of the structure it will be found. This, however, is pretty much characteristic of lime production.

The results of this test will certainly add encouragement to the fairly active wildcatting campaign that has been going on in Florida for the past 2 years. However, the returns to date indicate that such campaigns are going to be expensive, and may take a long time before the payoff.

MICHIGAN

New Oil Pool in Prospect For Montcalm County

SAGINAW.—Prospects of a new oil pool in Day Township, Montcalm County, excited oil men and residents of that area this week in a manner reminiscent of the discovery 10 years ago of the Crystal field, 5 miles to the southeast.

Shut down for a week, the 1 Wickes, wildcat drilled by McClure Drilling Co. of Alma, was to be tested this week. It was reported to have gaged 1,500 ft. of oil in the hole. Bottom was at 3,390 ft. in Dundee. Experienced oil men said the prospects were good for a small or moderate new pool, pointing to several dry holes drilled within 2 miles of the new development.

The other major center of oil interest, Pure Oil Co. 1 Freers in Garfield Township, Clare County, was reported still coring and pure officials said that wildcat, which showed strong gas and distillate potentialities, may be ready for testing in a week or so.

The week's activities resulted in 20 completions while 14 new locations were set. Daily potential for 6 new producers was 3,225 bbl., the bulk from 2 wells in Isabella's Coldwater field, where Pure Oil 1 Wernette came in for 96 bbl. an hour and Sohio Petroleum 2 Dent made 500 bbl. a day. Two other producers are in Bay County, and two are wildcats, a 5-bbl. well in Arbela Township, Tuscola County, and a 50-bbl. well producing with salt water in Mentor Township, Oscoda County. Of the 11 dry holes, 5 were wildcat tests and 3 were in Deep River field, Arenac County, which shows signs of nearing limits of its development.

Six of the 14 new locations are in Allegan County, 3 in Gratiot, where a new gas field is developing, and 1 each in Ogemaw, Montcalm, Missaukee, Kent and Arenac.

SUCCESSFUL MICHIGAN WILDCATS

Oscoda County, Mentor Township: Ohio Oil 1 Mio Unit, SE NW SW 30-25n-3e, swabbed and flowed 51 bbl. with salt water, TD 5,135 ft.

Tuscola County, Arbela Township: Fred Riddell 1 Luney-Clark, NW SE NW 33-10n-7e, flowed 5 bbl. a day, acidizied in Dundee, TD 2,640 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Dorr Township: Clyde B. Miller 1 C. J & I. J. Rewa, NE SW NW 34-4n-12w, dry in Traverse, TD 1,627 ft.

Jackson County, Concord Township: Clifford A. Perry 1 William T. Gundermann, SE SW SW 19-3s-3w, dry in Traverse, TD 1,606 ft.

Newaygo County, Goodwell Township: Michigan Consolidated Gas Co. 1 State-Ward, C SE 31-14n-11w, dry, TD 1,117 ft.

Ogemaw County, Mills Township: Arenac Oil & Gas Co. 1 Turbock & Valiant, SW SE SE 12-21n-3e, dry in Berea, TD 1,813 ft.

St. Clair County, Port Huron Township: C. J. Farley 1 W. B. Beach, SE SW NW 32-7n-17e, deepened to 1,024 ft., dry hole.

CALIFORNIA

High Flow Rate Reported At Orange County Test

LOS ANGELES.—Hiawatha Exploration Co. appears to have discovered a new productive area approximately ½ mile east of the Surf section of the Huntington Beach field, but the geological significance of the new accumulation is not yet clear. Hiawatha's discovery well, 2 Atha, in Section 13-6s-11w in Orange County, came in flowing 750 bbl. per day of 23.4°-gravity oil but the bean was cut out by sand and production rose to 2,000 bbl. daily. The productive interval is at 2,990-3,040 ft. and the well has plenty of kick. Wilshire Oil Co. is taking production of the well and until the company's line is completed every available truck and trailer is being utilized. Wilshire is laying a 6-in. line from the Newport-Costa Mesa field to the pump station at Huntington Beach, a distance of about 12 miles, and the new area will be cut into this line as soon as completed. Hiawatha's initial well in this area, completed pumping 185 bbl. daily, is located 135 ft. south and 890 ft. west of the northwest corner of Section 13 and the company's latest completion, No. 2, is located 400 ft. south and 550 ft. west of the northeast corner of the same section. The difference in production is remarkable considering the relatively short distance separating the two locations. Signal Oil Co. is preparing to begin immediate drilling on a location southeast of Hiawatha's new completion and an immediate spud will be made. The productive zone in Hiawatha's new well appears to be the equivalent of the B zone in the Newport-Costa Mesa field

which is of Miocene age and therefore this new accumulation may tie in with Newport rather than Huntington Beach.

In the Kettleman Middle Dome, Standard is still held up with a fishing job in its deep test but an early recovery is anticipated. At 10,800 ft. this well has about 1,000 ft. to go before reaching the objective sand in the Eocene. Structural conditions are favorable in this area and it is only a question whether the Eocene sand contains an accumulation of oil and gas. The Temblor was productive for a time in the middle dome but gradually reached the depletion stage at the conclusion of which production activities stopped.

Locations during the current week were on about a par with completions and inasmuch as locations usually precede actual drilling by several weeks it is logical to assume that drilling in May will continue at about the April average which was below last year. Deep zone development is getting in full swing in the Wilmington field, however, and if this work continues to increase this will be reflected in drilling totals. To date this work has not been reflected in new drilling reports as many of the wells have been deepened and not started from the surface. Deepening operations are not reflected in drilling operations which include only new wells. Some of these recent completions in the deep sand have shown large initials and have caused field production to be well in excess of prescribed quotas.

CALIFORNIA WILDCAT FAILURES

Kern County, Dyer Creek: Texas 1 Cairns, 14-26s-27e, bottomed in gray sand, top barren Vedder sand of Miocene age 2,422 ft., TD 2,453 ft.

Temblor: Gene Reid Drilling Co. 26 Anderson, 18-29s-21e, bottomed in shale, no important showings, TD 2,662 ft.

Temblor: Richfield 1 M. & L. fee, 18-29s-21e, bottomed in gray sand, top Phacoides 3,182 ft., main Phacoides 3,228 ft., no important showings, TD 3,280 ft.

Big Smoothies
AMERICAN RADIAL ROLLER BEARINGS
For nearly every application where the load is radial you'll find an AMERICAN RADIAL ROLLER BEARING to meet your requirements. Engineered to exacting standards, precision tested, specially designed for smooth, reliable operation under tremendous loads, AMERICAN RADIAL ROLLER BEARINGS function flawlessly in the heaviest equipment built and under the most rigorous operating conditions encountered in any industry.
AMERICAN RADIAL ROLLER BEARINGS come in 5 styles, 4 S.A.E. series and 85 sizes. Special designs to order are also available. Our engineers will cooperate with your own technical staff on all your roller bearing problems.
AMERICAN ROLLER BEARING CO.
PITTSBURGH, PENNSYLVANIA
Pacific Coast Office:
1718 S. Flower St., Los Angeles, California
D-6
AMERICAN
Heavy-Duty ROLLER BEARINGS

PERMIAN BASIN

Kent County Ellenburger Discovery Completed

MIDLAND.—Humble Oil & Refining Co 1 Vick, Section 45, Block 5, H&GN Survey, pool opener in southwestern Kent County, 2 miles northwest of Polar, has been completed. It flowed 214 bbl. of 38.6°-gravity oil in 24 hours through ½-in. choke on 2-in. tubing. The oil was cut 3.3 per cent with basic sediment and water. Production is in the Ellenburger through perforations from 7,775-7,810 ft. Gas-oil ratio was 290 to 1. Tubing pressure was 15 to 5 and casing pressure was zero.

Argo Oil Corp. 1 Dora Roberts, Section 294, Block 13, H&GN Survey, deep wildcat in southeastern Reeves County, 6 miles east of Saragosa, made an 8-hour drill-stem test from 10,703-729 ft. There was gas to the surface in 7 minutes, gaged at the rate of 458,000 cu. ft. daily after 20 minutes and 214,000 cu. ft. after 7 hours. After pulling 750 ft. of drill pipe, the well started unloading oil and recovered 3,060 ft. of fluid (75 per cent green oil and 25 per cent drilling mud, no water). Gravity of the oil was 44°. Last formation called was the Wolfcamp, topped at 10,120 ft. Operator was going back in the hole to retest.

Superior Oil Co. of California 1 Eva B. Coopwood, Section 4, Block A-41, Public School Land Survey, has opened a new Tubb producing area south of the multiple-pay Fullerton field in Andrews County. A drill-stem test taken from 6,974-7,000 ft. had gas in 3 minutes, Oil-cut drilling fluid in 16½ minutes and oil in 21 minutes. It was turned into tanks for 5 hours and produced 260 bbl. of oil. Estimated gas-oil ratio was 1,600 to 1, gravity of oil corrected to 42.5°. The discovery is 5¼ miles south of the nearest Tubb producers in the original Fullerton field. Operator will cement 7-in. casing at 6,845 ft. and complete in open hole.

Fullerton field, Andrews County, had four completions this week, and Garza field, Garza County, had five. Slaughter field, Cochran and Hockley counties, and McElroy field, Upton County, had three locations and North Ward Estes field, Ward County, and TXL field, Ector County, each had two. TXL field has 40 drilling wells; Keystone-Ellenburger field, Winkler County, 31; Fullerton field, Andrews County, 28; Block 31 field, Crane County, 20, and Welch field, Dawson County, 15.

WEST TEXAS SUCCESSFUL WILDCATS

Ector County: New oil pay: Phillips et al 1 Eidson et al, Sec. 25, Blk. B-15, PSL Sur., Penwell pool, elev. 2,925 ft., flowed 1,065 bbl. day through ½-in. choke on 2-in. tubing, perf. 8,920-50 ft. Ellenburger, gravity 43.5°, gas-oil ratio 573 to 1, TD 9,020 ft.

New oil pool—Stanolind 1 Grisham-Hunter Corp. (was Grisham-Hunter 1-B Cowden), Sec. 10, Blk. 45, T-2-N, T&P Sur., north of Goldsmith field, elev. 3,309 ft., flowed 445 bbl. day through ¼-in. choke on 2-in. tubing at 7,955 ft., top of pay 7,919 ft. Devonian, gravity 43°, OTD 6,499 ft., NTD 7,956 ft.

Runnels County: New oil pool—Gillespie & Sons 1 B. N. Wilke, Sec. 1, Day Land & Cattle Co., 5 mi. NE Runnels, elev. 1,810 ft., pumped 19 bbl. day through

(Continued on page 156)

EQUIPMENT *from the ground up!*

1 **SUB-BASES** for Jackknife Cantilever Masts are designed as an elevating support for the mast's regular skid base. Will provide the under-the-floor clearance required, from 3'8" to 7'8" or more; lengths adjustable to suit the rig.

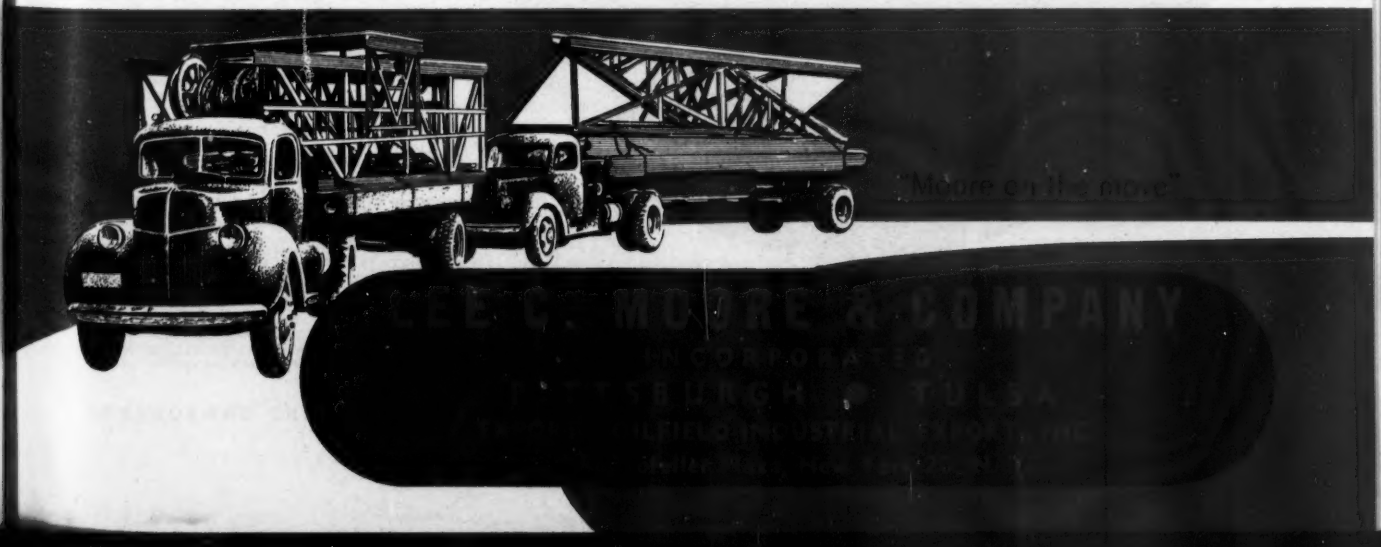
2 **ADJUSTABLE STAIRS** adaptable as one or two flight installations. Heavy construction to withstand abuse. Stairs are adjustable by swinging to the required height, within their range, treads remaining level. All treads are 2'6" wide and 11" deep, formed from punched plate flooring. Single flight stairs are available in 7 sizes from 1'9" to 15'0". Two-flight available in 2 sizes, 14'0" to 16'4" and 15'0" to 17'0".

3 **TRUCK RAMP** a double skid unit of heavy welded construction that provides easy access to floor. Dismounts and ships as two separate parts forming a single compact unit. Available in single units 4', 5' and 6' high; in double combinations of two 4', two 6', or 4' and 6'. Carriage bolts are furnished for attaching deck timbers.

4 **CANTILEVER MAST** (Patented), a portable self-supporting rotary drilling mast that is quickly assembled and easily raised to the operating position. Capacities from 300,000 pounds to 450,000 pounds. Heights 87', 95', 98' and 127'.

The rear legs are hinged to the mast so that they will swing back to provide clearance for the largest draw-works. The length of the base can be adjusted in the field to suit the draw-works power. The mast does not have to be entirely dismantled to move it to a new location. Lines do not have to be re-strung.

Moore Service from conveniently located stores and offices in Houston, Kilgore, Dallas, Odessa, Wichita Falls, New York, Pittsburgh, Tulsa, Centralia, Wichita and Great Bend.



2-in. tubing, perf. 2,462-90 ft. Canyon, Gravity 40°.

WEST TEXAS WILDCAT FAILURES

Cochran County: Gulf 1 T. J. Taylor et al, Sec. 43, Harrison & Brown Sur., 1 mi. N Landon pool, elev. 3,806 ft., San Andres 4,358 ft., dry, TD 5,153 ft.

Pecos County: Byrd-Frost, Inc. 1 L. H. Miller, Sec. 53, Blk. 11, H&GN Sur., 5 mi. S Girvin, elev. 2,583 ft., dry, TD 1,639 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—The Pure Oil Co. will drill a 7,000-ft. wildcat to the Pennsylvanian in eastern DeBaca County 1½ miles northwest of Taiban and 13 miles east of Fort Sumner. It is 1 Federal, NW NE 31-3n-28e. Continental Oil Co. 4-B-23 Skaggs, 23-20s-37e, outpost to the Cass field of Lea County, apparently had developed a new lower Permian producing zone. Plugged back from 7,900 ft. to 6,837 ft., it flowed naturally 100 bbl. of pipe line oil with 138,000 cu. ft. of gas through perforations. Flowing casing pressure was 460 lb. and flowing tubing pressure 40 lb. The test was perforated from 6,660-6,720 ft. It was reperforated with 240 shots and swabbed natural for no shows in 5 hours. Operator was preparing to acidize.

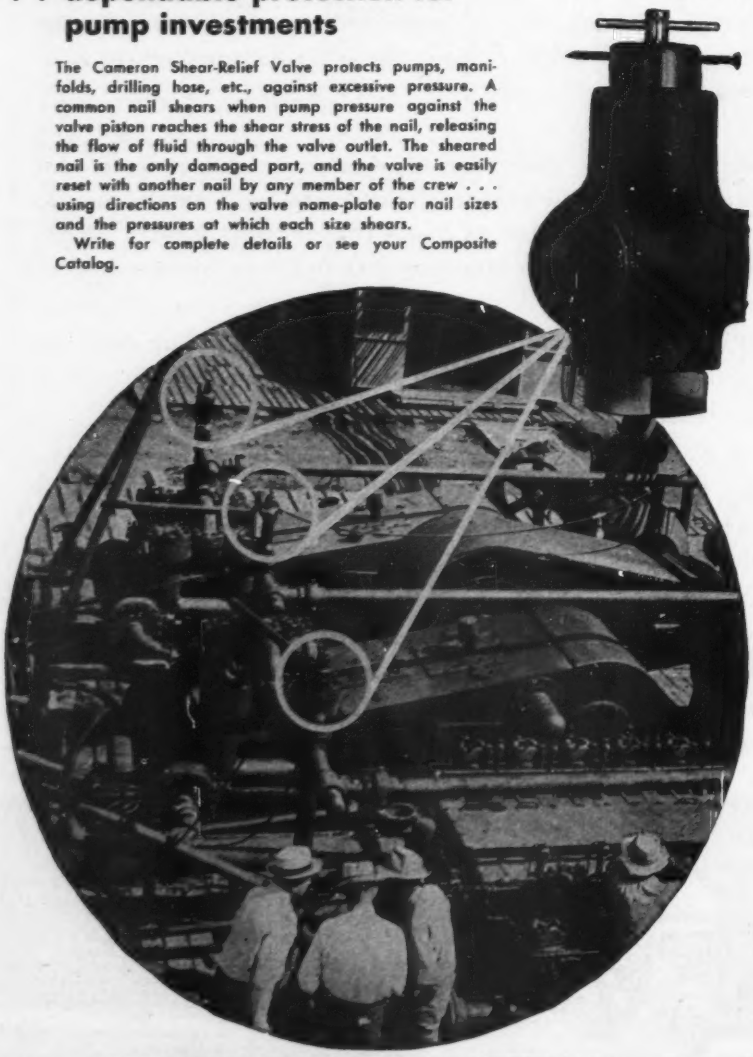
Fren and Square Lake field, Eddy County, and Langlie-Mattix field, Lea County, each had one completion this week. Grayburg-Jackson, Eddy County, had two locations and Langlie-Mattix, Drinkard, Caprock and Brunson fields, Lea County, one each. Caprock field, Chaves and Lea counties, has 29 drilling wells; Square Lake field, 14; Grayburg-Jackson field, 11; Drinkard field, 8, and Paddock field, 5.

CAMERON SHEAR-RELIEF VALVE

. . . dependable protection for pump investments

The Cameron Shear-Relief Valve protects pumps, manifolds, drilling hose, etc., against excessive pressure. A common nail shears when pump pressure against the valve piston reaches the shear stress of the nail, releasing the flow of fluid through the valve outlet. The sheared nail is the only damaged part, and the valve is easily reset with another nail by any member of the crew . . . using directions on the valve name-plate for nail sizes and the pressures at which each size shears.

Write for complete details or see your Composite Catalog.



CAMERON IRON WORKS, Inc.

711 MILBY ST., HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. California: The Howard Supply Co., Los Angeles. Oklahoma: 310 Thompson Bldg., Tulsa.

SOUTHWEST TEXAS

New Gas-Condensate Field Opened in Jim Wells County

CORPUS CHRISTI.—A new gas-condensate pool has been opened in Jim Wells County, by Shell Oil Co., Inc. 1 Wm. van Hoogenhuyze, located 2 miles east of Wilson field in Lot 6, Block 10, of Burton and Danforth subdivision of Parrita Ranch, 4½ miles southeast of La Gloria townsite. On initial test the well flowed 4,500,000 cu. ft. gas per day through a ¼-in. choke with a little wash water and condensate in the flow. The flow is through perforations at 9,023-38 ft. and 9,060-69 ft. Total depth is 10,086 ft., with 4-in. liner set to 9,417 ft.

Continental Oil Co. 1-B Albert West, in Albert West field, Live Oak County, is testing a prospective new pay sand at 6,980-84 ft. A 20-minute drill-stem test at 6,786-91 ft. in the regular 6,700-ft. discovery pay zone, in the Wilcox, recovered 31°-gravity oil. Operators cored gas sand at 6,967-74 ft., and oil sand 6,975-84 ft., with saturation and cut of oil.

The Petronilla field in Nueces County has been extended to the southeast by Stanolind Oil & Gas Co. 3-A J. T. Gillette. It flowed 85 bbl. of 40°-gravity clean oil per day on drill-stem test through perforations at 6,945-48 ft. Regular field pay is at 6,950 ft. Flow was through a 3/32-in. top choke and ⅛-in. bottom choke, with 900 lb. working pressure, gas oil ratio 694 to 1. Total depth is 9,516 ft., with 5½-in. casing set to 6,970 ft., plugged back to 6,960 ft. for completion.

There were 44 new locations reported this week with 11 being wildcats, 3 in Bee, 2 in Duval and Webb counties, and 1 each in Bexar, Calhoun, Starr, and Victoria counties. The Gas Ridge field in Bexar county received the greatest amount of activity with eight new locations reported. The 35 completions included 9 wildcats, 2 successful and 7 dry. Bee and Webb counties reported the successful wildcats while the dry holes were two in San Patricio, one each in Bastrop, Gonzales, Jim Hogg, Webb, and Willacy counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Bee County: New oil pool—Bridwell Oil Co. 1 Sliva Estate, F. O. Skidmore Survey 4, 9 mi. SW Beeville, 4½ mi. SW of Yougeen field gas production and 3½ mi. NW of Tynan field, TD 4,555 ft., top pay 4,377 ft. (Stillwell sand), perf. 60 holes 4,378-88 ft., PT 23 bbl. oil per day through 7/64-in. choke, gas-oil ratio 300 to 1, TP 225 lb., CP 1,050 lb., gravity 48°, no water.

Webb County: New gas pay in North Albercas pool—Blanco Oil Co. and A. Buchanan 5 A. M. Bruni Estate, Block 28, Brown Subdivision of Albercas Grant, top pay 2,520 ft., Pettus sand, TD 2,649 ft., perf. 24 holes 2,521-27 ft., PT: gas well, no gage, SIP 650 lb., no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bastrop County: A. J. Stormfeltz 1 Fitzwilliam Est., J. M. Bangs Sur., 4 mi. NE of Cedar Creek, 7 mi. W of Bastrop, dry, TD 2,302 ft.

Gonzales County: Quintana Pet. 1 Anna Spahn, Gonzales Township, Blk. 17, Range 5, 4 mi. NW of Gonzales, dry, TD 10,845 ft., in Smackover.

Jim Hogg County: Panhandle Refg. Co. 1 Dave Gallagher, El Randado Grant, dry, TD 4,070 ft.

San Patricio County: Houser & Campbell 1 Jose R. Salinas, Porcion 110, 3 mi. NW of El Sauz, dry, TD 4,008 ft.

Zimmerman & Garcia 2 M. M. Garcia, D. G. Ainsworth Survey 918, in Rincon field area, dry, TD 3,504 ft.

PUMPS

CENTRIFUGAL
RECIPROCATING

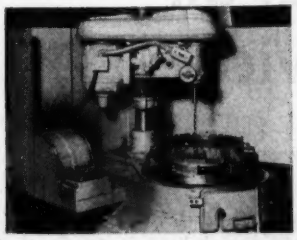
BUILDERS OF OUTSTANDING PUMPS
Since 1869

ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.
INDIANAPOLIS IND.
323 W TENTH ST.

Specify ROCKFORD
OVER-CENTER
for CLUTCHES

EASY OPERATION
HIGH TORQUE
POSITIVE ENGAGEMENT
LARGE DRIVING AREA
SMOOTH RUNNING
INFREQUENT ADJUSTMENT
MINIMUM INERTIA



* An electronic gauge accurately checks the balance of each ROCKFORD Over-Center CLUTCH, before it passes final inspection, to prevent drag or centrifugal force from affecting its smooth-running operation.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION
It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS
Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning postwar products.

ROCKFORD CLUTCH DIVISION BORG-WARNER
1305 Eighteenth Avenue, Rockford, Illinois, U. S. A.

ROCKFORD CLUTCHES

THIS EMBLEM

is a sales-mark of first importance

The emblem of the Pennsylvania Grade Crude Oil Association is not a brand-mark. Neither can it be employed as such. Regulations covering its use are most explicit on this point.

But it is a *sales*-mark of first importance . . . an assurance to the consumer that a motor oil is 100% Pure Pennsylvania and up to the Association's rigid quality standard in every respect. It also assures the consumer that those who sell it put oil quality and oil performance ahead of everything else.

PENNSYLVANIA GRADE
CRUDE OIL ASSOCIATION
Oil City, Pennsylvania

For your protection, only oils made from 100% Pure Pennsylvania Grade Crude which meet our rigid quality requirements are entitled to carry this emblem, the registered badge of source, quality and membership in our Association.

Webb County: Chicago Oil Co. 1 A. M. Bruni, Survey 600, dry, TD 1,606 ft.
Willacy County: Dan Auld 1 Dan Auld-Harvey Geis et al, Hardin Gill Subdivision, Share 16, dry, TD 10,003 ft.

SOUTH LOUISIANA

Egan Field Productive Area Extended by Dry Gas Well

NEW ORLEANS.—Production at Egan field in Acadia Parish was extended ¾ mile to the west by a dry gas well. Irwin & Hudson 4-B Houssiere-Latreille, 30-9s-2w, is flowing gas with 3,500 lb. pressure on the tubing through 24 perforations at 10,675-680 ft. Total depth is 10,700 ft., and 5½-in. casing is set on bottom with sands from 10,640-680 ft.

Six new tests have been located in the Mamou field discovery area of Evangeline Parish. All but two are offsetting the discovery well, Magnolia Petroleum Co. 1 J. B. Morein center NW SW 5-5s-1e. Offsetting the discovery to the north is 1 Walter Reed, center SW NW Section 5, and to the east is 1 Landreneau-Manuel Unit, center NE SW Section 5. To the west is 1 Morein-Landreneau Unit, center NE SE Section 6, and to the south 1 Levy Smith which is center SW SW Section 5. Magnolia 1 L. F. Duos, ¾ mile west of the discovery well, is reported to have picked up a new deep zone of saturation from approximately 11,775-90 ft. Contract depth is 13,000 ft. The 1 Guillory-Landreneau Unit is located in center SW SE 6-5s-1e, and 1 Deshotel is in center NW NE Section 6.

M. C. McGehee, Jr., 1 Hawkins Heirs, 23-1s-1w, 12 miles north of the Pine Prairie field in Evangeline Parish, is a new 10,500-ft. wildcat test.

The 13 new locations reported this week included 2 wildcats, 1 each in Acadia and Evangeline parishes. The eight completions, five oil wells and three dry holes, are all in proven areas, one each in Assumption, Iberia, Jefferson Davis, Lafourche, Plaquemines, St. Landry, St. Martin, and Terrebonne parishes.

Interlocked to LAST LONGER in hot oil service

FOR HOT OIL SERVICE you need a packing with real stability—like J-M No. 270 Interlocked—that can't unravel or come apart.

The asbestos yarns used in this rod and plunger packing are actually *interlocked* to form a solid structure; it has no jackets to wear through, no plaits to come loose . . . *it stands up in hot oil service!*

J-M No. 270 Interlocked is *braided square* to provide a tight seal with minimum gland pressure . . . another feature that means better performance.

There are Johns-Manville Packings specially designed for every type of service in the oil industry. At your Supply House—or write Johns-Manville, Box 290, New York 16, N.Y.

JM

Johns-Manville PACKINGS & GASKETS

TEXAS GULF COAST

Quinn Sand Is New Oil Pay in McCoy Pool

HOUSTON.—The Ohio Oil Co. 2-A B. E. Quinn, in Daniel Donahoe League, McCoy pool, has been completed in a new oil sand which will be known as the "Quinn sand." Drilled to a depth of 9,800 ft., with 5½-in. casing at 9,204 ft., and perforated with 24 holes from 9,125-31 ft., potential gage flowed 61 bbl. of 32°-gravity oil daily through a ¼-in. choke with gas-oil ratio 386 to 1, and 60 lb. pressure on the tubing and 1,250 lb. pressure on the casing.

The discovery well for the McCoy field, Liberty County, Ohio Oil Co. 1 Kirby Lumber Corp. has been reworked and completed as an oil producer. Original completion was in March 1946, when the well was completed as a gas-condensate discovery and showed 18 per cent salt water along with a gage of 51 bbl. of 54°-gravity condensate and 1,167,000 cu. ft. of gas daily through a ⅜-in. choke. These perforations, 9,106-27 ft., were squeezed and pipe was reperforated with 12 shots at 9,106-12 ft., where it is completed for a gage of 96 bbl. of 32°-gravity oil daily through a 10/64-in. choke. This is known as the "Kirby sand." Total depth is 10,285 ft., and 7-in. casing is cemented at 9,272 ft.

Stanolind Oil & Gas Co. 1 Helen C. Hurlock, 3,000 ft. north of production in the Sugar Valley field of Matagorda County, recovered oil on drill-stem test at 8,961-87 ft., using ⅜-in. and ¼-in. chokes. After being open 12 minutes, the well blew in through the drill stem and blew 30°-gravity oil, gas and mud over the derrick for 15 minutes with 3,050 lb. flowing pressure. Tool was closed and the well recovered 12 stands of clean 30°-gravity oil, no water. Operators are coring ahead below 9,058 ft. in sand. This well is scheduled to be drilled to 10,500 ft.

The South Mayes pool of Chambers County was extended to the northwest by Humble Oil & Refining Co. 1 Annie Frankland, in Samuel Mather Survey. On initial gage the well flowed 11 bbl. of 54°-gravity condensate in 8½ hours through a ⅛-in. choke. It is now shut in at total depth of 9,900 ft., with 5½-in. casing set to 9,820 ft. Well was plugged back to 9,154 ft., and perforated from 9,110-20 ft. for production.

Fifteen new locations were reported this week, the Lane City pool of Wharton County taking the lead with two new tests. Five wildcats were reported, one each in Chambers, Fort Bend, Harris, Jackson and Montgomery counties. Of the 19 completions 7 were wildcats, 3 successful and 4 dry holes. McCoy field in Liberty County received a new oil sand and Blessing field and Sugar Valley field, Matagorda County each received a gas-condensate new pay. The dry wildcats are one each in Chambers, Grimes, and two in Wharton counties. Wharton County received the greatest activity this week, with four wells completed and four locations staked.

UPPER GULF COAST SUCCESSFUL WILDCATS

Liberty County: New oil sand, McCoy field

—The Ohio Oil Co. 2-A B. E. Quinn, in Daniel Donahoe League, TD 9,800 ft., top sand 9,125 ft., perf. 24 holes 9,125-31 ft., PT 61 bbl. per day through a ¼-in. choke, gas-oil ratio 386 to 1, TP 60 lb., CP 1,250 lb., gravity 32°, 0.5 per cent water.

Matagorda County: New condensate sand, Blessing field—American Liberty and Texas Co. 1 Dela Braden, Unit 1, Lot 36, TD 10,149 ft., top sand 8,425-67 ft., perf. 105 holes 8,426-61 ft., PT 70,000,000 cu. ft. gas per day open flow and 180 bbl. condensate per day through 10/64-in. choke and 5,500,000 cu. ft. gas through 10/64-in. choke, gas-oil ratio 30,437 to 1, TP 2,830 lb., SITP 3,015 lb., gravity 55°, no water.

New gas-condensate sand, Sugar Valley field—Skelly Oil Co. 1 B. N. Cocke, P. Burnett and A. S. Sojourner Survey, TD 8,400 ft., top sand 7,674 ft., perf. 16 holes 7,674-78 ft., PT: 1,110,000 cu. ft. gas per day through a ⅛-in. choke and 8 bbl. condensate per day, TP 2,825 lb., gravity 52°, no water.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: Windsor Oil Co. 1 R. L. White, T&NO Survey, 1½ mi. N of Fig Ridge field, dry, TD 8,520 ft.

Grimes County: Dean A. Bennett 1 Sealy-Smith Foundation, W. M. McIntyre Survey, 5 mi. N of Plantersville, dry, TD 4,228 ft.

Wharton County: Dick Schwab 1 Cates & Kemp, S. F. Austin Survey, 2 mi. off SW flank of Boling dome, dry in Frio, TD 7,740 ft.

The Salt Dome Oil Co. 1 C. L. Tucker, Mark Weiss Survey, 5 mi. SE of El Campo townsite, dry, TD 7,352 ft.

APPALACHIAN FIELD

Pennsylvania Well Flows 250 Bbl. of Oil Daily

PITTSBURGH.—In North Strabane Township, Washington County, southwest Pennsylvania, Charles E. Young completed No. 2 Senkinc in the Gordon sand, total depth 2,552 ft., where the hole began filling up with oil and flowed 650 bbl. in the first 2 days. The well is now flowing at intervals and is making about 10 bbl. an hour. After it subsides, an attempt will be made to deepen it.

In Penn Township, Allegheny County, Paul Schwer drilled a test on the Alcoma Country Club about 1 mile west of Unity and at 2,048 ft., about 20 ft. in the Hundred Foot sand, the hole began filling up with oil and reached to within 300 ft. of the top. It is about 1 mile from oil production and 275 bbl. were swabbed in 3 days. It will be deepened when arrangements have been completed to take care of the oil which is now being hauled.

New locations totaled five and were located in Armstrong and Clarion counties.

In Oceana district, Wyoming County, United Producing Co. completed 1,276 Pardee Land Co. as a Maxton sand gas well good for 7,570,000 cu. ft. with the sand topped at 1,959 ft., gas 2,023-45 ft., total depth 2,047 ft. This is the largest in the area. In Baileysville district, this company completed 1,308 W. M. Ritter Lumber Co. which gaged 5,514,000 cu. ft. gas, with the Big Lime 2,396 ft., Berea 3,343 ft., gas 3,354-73 ft., and total depth 3,378 ft. The well was not shot.

New locations during the week totaled 22, and were situated in Boone, Brooke, Calhoun, Gilmer, Kanawha, Lewis, Lincoln, Logan, and Mingo counties.

Look Ahead With First National

An OIL BANK

Directed by Oil Men in the Oil Capital of the World

KEYED TO THE

Petroleum Industry

—Pioneer in Oil Financing

THE FIRST NATIONAL BANK AND TRUST COMPANY OF TULSA

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CANADIAN FIELDS

De Winton Area Wildcat Recovers Show of Oil

CHATHAM.—In the De Winton area, east of the Turner Valley north extension and 15 miles south of Calgary, Royalite-De Winton 1, LSD 14, 16-21-1w5, made drill-stem tests of oil showings encountered at 8,148 ft. near the Kootenay-Brown sand contact. Initial test showed a rise of 280 ft. in the column of drilling fluid, with the top 20 ft. light crude, and no water. The well has resumed coring toward the Madison limestone.

Hay River.—In the Hay River area south of Great Slave Lake, Hay River Exploration Syndicate 1 structure test encountered a good gas flow at 545 ft. and confirmed the Madison lime at 639 ft. The test is one of four sponsored by T. Boyd Kyle and associates on a northern Alberta structure close to the road between Hay River and Peace River, and is the most northerly activity in Alberta.

Antelope Hills.—In the Antelope Hills area, eastern Alberta, Alliance 1, LSD 15, 19-20-1w4, has encountered small oil shows in anhydrite about 100 ft. above the Devonian limestone. The well previously encountered oil as well as gas shows in the Bow Island sand; and portable standard outfit will be used on Alliance 2, LSD 2, 18-20-1w4, which will be drilled to test the Bow Island showings.

Lloydminster.—In the Saskatchewan section of the Lloydminster field, Saskatchewan-Alberta Consolidated 4, LSD 16, 3-49-28w3, which started with initial production of 1,000 bbl. daily from 1,876 ft., is pumping about 100 bbl. and expected to settle between 70-100 bbl.

Kinsella.—In the Kinsella field, east-central Alberta, Imperial-Kinsella 11, LSD 7, 28-47-8w4, outpost test to the south, has been abandoned at 2,030 ft. Three other tests are drilling.

STEEL
in
STOCK
for Prompt Shipment

The Ryerson Steel-Service Plant near you can normally supply needed steel—at once.

Ryerson engineers and metallurgists are ready to work closely with you on problems of selection or fabrication.

Ryerson deliveries are prompt and dependable.

Call Ryerson *first* whenever you need steel in a hurry.

Write for the Ryerson Stock List and Steel Data Book, dependable guide to more than 10,000 sizes, shapes and kinds of steel including: bars, structurals, plates, sheets, strip steel, tubing, alloy steel, Allegheny Stainless, tool steel, Inland 4-way floor plate, reinforcing bars, bolts, rivets, babbitt, solder, welding rod, metal working tools and machinery, etc.

Joseph T. Ryerson & Son, Inc., Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cleveland, Cincinnati, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON

ROCKY MOUNTAIN

Tubing Set for Final Test Of Church Buttes Discovery

DENVER.—Tubing is being run for final test on Mountain Fuel Supply Co. 1 Unit, C SW NW 8-16n-12w, Church Buttes discovery well in Uinta County, southwestern Wyoming, at a total depth of 12,887 ft. Last drill-stem tests reported were at 12,550-64 and 12,572-12,609 ft., open 2 hours, estimated at 10,600,000 cu. ft. of gas per day and 20 bbl. of oil per hour. The oil was approximately 42° gravity. This test was the highest up in the hole of the series and in the top of the Dakota sand. A second well, 2 Unit, NE 22-17n-112w, 5 miles to the north and east will be drilled immediately. It is across the line in Sweetwater County.

South Elk Basin.—Continental Oil Co. 5 Northern Pacific, NE SE NW 29-57n-99w, South Elk Basin field, marks the limits of the Tensleep pool on the south. It topped the Tensleep at 7,296 ft., and was drilled to 7,311 ft., encountering water in that horizon. It will plug back to 7,300 ft., set the 7-in. and test the Embar, topped at 7,245 ft., and the Dakota and Morrison gas sands. It is located ½ mile south of the Tensleep discovery well, with one pumper completed in between the two. It ran 169 ft. lower than the north offset. No Tensleep wells have been drilled north of the discovery, but a northwest offset was completed as a gas well in the Dakota sand.

Small show in Iles test.—Stanolind Oil & Gas Co. 1 Madison, NW SW SE 22-4n-92w, Iles Dome, Moffat County, Colorado, a test to the Weber and Madison cored a show of saturation in sand at around 3,900 ft. A drill-stem test at 3,835-3,933 ft., open 1 hour, had a recovery, however, of 3,400 ft. of fresh water and mud. The packer failed to hold and water may have come down from upper horizons. The Morrison and Sundance sands, the producing horizons at Iles, were cased off with the 9⅝-in. at 3,541 ft. in the top of the red beds. Top of the Weber is expected at around 4,500 ft.

River Dome tests.—Pure Oil Co. 2 Unit, Lot 1, Section 12-48n-92½w, River Dome, Washakie County, Wyoming, a mile north of 1 Unit, the discovery well, topped the Muddy sand at 8,407 ft. A drill-stem test at 8,415-42 ft., open 30 minutes, recovered 10 ft. of oil, 160 ft. of mud, and 90 ft. of fresh water. It was coring at last report at 8,697 ft. in grey barren Dakota sand and shale. The 1 Unit is rigging up high pressure equipment in an attempt to pull the tubing which is frozen by condensation of hydrates.

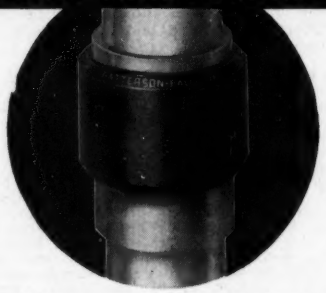
New operations—Twelve new operations were reported of which one was in the Rangely field in Colorado, four in Wyoming and seven in Montana. The Wyoming locations included one in Garland by Ohio Oil Co., one at Zimmerman Butte by Pacific Western Oil Corp. and Frontier Refining Co., a wildcat by General Petroleum Corp. in Washakie County, and another wildcat by Mountain Fuel Supply Co. and Union Pacific Railroad on the Church Buttes structure in Sweetwater County. The General Petroleum well is 88-24-G, SE SE SE 24-46n-92w, Washakie County, 15 miles south of the Pure Oil Co. discovery at River Dome and 10 miles southeast of the town of Worland. Like the Pure well, it is located out in the Big Horn Basin and will be a deep test, probably to 10,000 ft. or more. While General Petroleum has an interest in the River Dome unit, this is an independent operation on a separate struc-

PENBERTHY
AUTOMATIC INJECTORS

The accepted method for assuring an uninterrupted supply of feed water to oil field boilers. Penberthy Automatic Injectors will supply feed water to boilers at minimum cost, are quickly and easily installed, reliable under most severe operating conditions, require little attention and no careful handling. Highest quality design and rugged construction.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

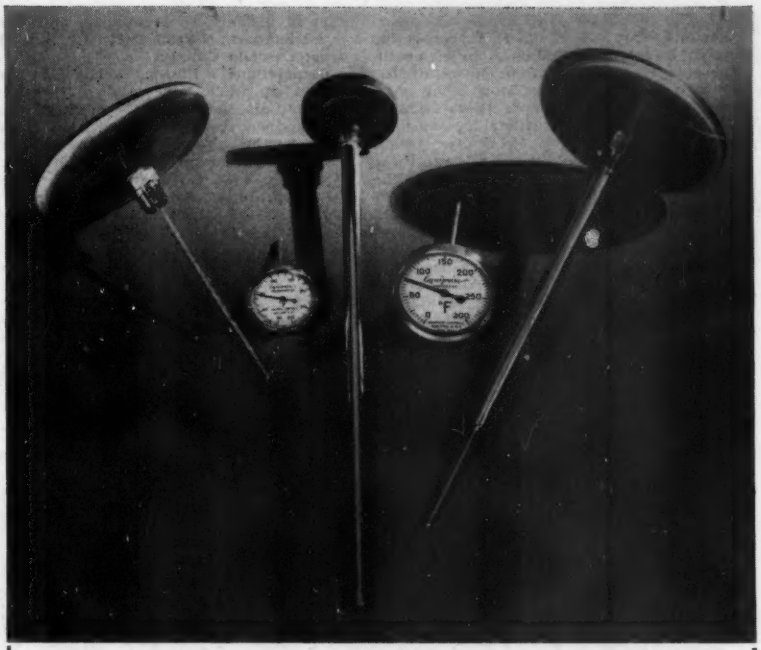
"Best Bet Yet"
SAVE YOUR TUBING!



Tubing collars worn by contact with casing steal the profit out of pumping. Patterson-Ballagh Plastic Tubing Protectors prevent both collar and casing wear. Oil-proof, wear-resistant, insulating. They are cemented to the collar under pressure and will not come off. Made in all sizes. End your tubing troubles. CALL in your Patterson-Ballagh man.

Specify "Best Bet Yet"
PATTERSON-BALLAGH
PLASTIC
TUBING PROTECTORS

1306 Maury St. HOUSTON 10 — 92 Liberty St. NEW YORK 6 — Main office: 1900 E. 65th St. LOS ANGELES 1 — 1621 E. Yellowstone CASPER, WYO. — 210 Post St. SAN FRANCISCO 8



Equipoise PRECISION
Bimetallic Dial Thermometers

Employs the special tooling and experience gained in making thousands of the same type instruments for the Army Air Forces. Meets industry's demand for greater sensitivity and accuracy. Many standard ranges are available between the limits of minus 90° F. and 1000° F.

- Easy to Read Dial
- Instantaneous Response
- Only One Moving Part
- High Over-range Protection
- No Pinions, Gears or Linkages
- Individually and Permanently Calibrated
- Calibration Unaffected by Vibration
- Durable Stainless Case, Connection Nut & Stem
- Available with Tempered, Non-breakable Crystals
- Available in 2, 3 & 6 inch Dial Sizes
- Heavy Duty Sockets are Standard
- Low Cost—No Maintenance

EQUIPOISE CONTROLS

342 Madison Avenue — New York 17, New York

REPRESENTATIVES

Los Angeles—Brooks Equipment Co.
San Francisco—Brooks Equipment Co.
Seattle—Brooks Equipment Co.
New Orleans—Devlin Bros.
Houston—Climax Industries
Corpus Christi—Climax Industries
Fort Worth—Climax Industries
Wichita Falls, Tex.—Climax Industries
Odessa, Tex.—Climax Industries
Tulsa, Okla.—Climax Industries
Kansas City, Mo.—Mooney Engineering Co.
St. Louis, Mo.—MacGregor & Sears Co.
Chicago, Ill.—Nielsen & Fryer, Inc.
Boston, Mass.—Robert T. Forbes
Charlotte, N. C.—Alexander L. Schenck Co.
Atlanta, Ga.—Garrard, Sudderth & Seat
Jacksonville, Florida—Richard Barthelmess Sales Co.

ture. The Mountain Fuel Supply Co. operation is 2 Unit, NE 22-17n-112w, across the line in Sweetwater County 5 miles northeast of 1 Unit, the Church Buttes dissovery well in Uinta County, now being completed in the Dakota-Lakota sands at 12,887 ft., total depth. The Montana locations include one each at Cat Creek and Cedar Creek, two in the Cut Bank field, and three wildcats. One of the most important of the wildcats is Pure Oil Co. 1 State, CWL SW SE 36-2n-51e, on the Maxwell Butte structure, Custer County, in the eastern part of the state where very little exploration has taken place. It will go to the pre-Cambrian at around 9,550 ft. The Sundance is expected at 6,020 ft., the Pennsylvanian at 6,620 ft., and the Madison at 7,550 ft. The location is 22 miles north of Stanolind Oil & Gas Co. test on the Mizpah dome, Powder River County, abandoned last year at 8,991 ft. The other wildcats are Pilot Production Co. No. 1, NW NW NW 18-29n-2w, Conrad district, Toole County, and Thumlert 1 Sanborn, NW SE 23-2in-1w, Sun River area, Cascade County.

Completions.—Eleven wells were completed, of which 7 were oil wells for 1,102 bbl. initial, and 4 were dry holes. These included one in the Rangely field in Colorado for 286 bbl., one each in Gebo, East Lance Creek and Garland for 511 bbl. in Wyoming, 3 in Cut Bank, and 1 each at Lewiston, Milk River and Cat Creek, in Montana, the producers being 2 in Cut Bank and 1 at Cat Creek for 205 bbl.

COLORADO WILDCAT FAILURE

Wilson Creek, Rio Blanco County: Texas Co.-California Co. 20 Unit, NE SW NE 34-3n-94w, TD 12,702 ft., tested through Madison and probably into Devonian, but tops not released pending final determination. PB 6,925 ft., and temporarily completed in Morrison, flowing 600 bbl. per day, but will be converted into intake well for repressuring. Reported tops, Frontier, 5,830; Dakota, 6,210; Morrison, 6,295; Sundance, 6,820; Weber, 8,230; elev. 8,204 ft.

MONTANA WILDCAT FAILURES

Cut Bank, Glacier County: Union Oil Co. 3 Thomas Unit, C NW SW 11-35n-5w, TD 2,902 ft., top of Madison 2,880 ft., 800 ft. sulfur water, elev. 4,040 ft.

Lewistown, Fergus County: R. C. Tarrant 1 Dunn, C NW SW 2-15n-20e, TD 898 ft., top Ellis 450 ft.

Milk River, Glacier County: Carter Oil Co.-Phillips Petroleum Co. 1 Lucy Weaselhead, C SW NE 28-34n-12w, TD 10,102½ ft., top of Madison 10,076 ft., sulfur water, elev. 5,276 ft.

ILLBRONZE
ALUMINUM PAINTS
PLAY SAFE -on guard!

Maintain Your Equipment

PROTECT your precious equipment easily and economically with our famous 65 S Chrome Finish Paint! Nothing finer on the market for durability and coverage. Its high chrome finish effect is the result of the most modern equipment and continuous research. Refining equipment, tanks, engines—*all* metal and wood constructions—can be properly maintained with this ready-mixed quality paint—manufactured for over a generation and in world-wide use!

Consult your distributor or write direct for prices and samples.

ILLINOIS BRONZE POWDER CO., INC.

Dept. OIL, 2023 S. Clark St., Chicago 16

EASTERN TEXAS

Smith County Well Flows Oil on Drill-Stem Test

DALLAS.—Humble Oil & Refining Co. 1 Poole, William Sanders Survey, wildcat discovery 4 miles southwest of Mount Sylvan in northwestern Smith County, on a 70-minute test of the Paluxy from 7,339-52 ft. flowed 25 bbl. of fluid, cut 6 per cent wash water and mud. Flow was through ¼-in. choke. Gravity was 43.1°. Tubing and casing pressures were 400 lb. each. Paluxy was topped at 7,292 ft., and total depth is 7,668 ft. with elevation of 454 ft.

Magnolia Petroleum Co. and Seaboard Oil Co. 1 S. L. Orr, R. B. Fowler Survey, wildcat 3½ miles southwest of Avinger, Marion County, flowed 110 bbl. fluid in 9 hours, 3 per cent water, on latest test of the Travis Peak. Casing pressure was 600 lb. Operators are continuing to test.

Hawkins field, Wood County, had four completions this week and Long Lake field, Anderson County, and East Texas field, Gregg County, each had two. Hawkins field had four locations, Carthage field, Panola County, two, and Whelan field, Harrison County, one. Carthage field has 31

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington 25, D. C. Notice is hereby given that sealed bids will be received until noon on Wednesday, May 29, 1946, for lots 13, 14, 15 sec. 8, T. 3 N., R. 91 W., 6th P. M., 128.63 acres, within the known geologic structure of the Thornburg gas field, Colorado. This land is offered as a single parcel to the qualified bidder of the highest cash amount per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec. 226). Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for lease in Thornburg gas field, Colorado. Not to be opened before noon, May 29, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by the successful bidder prior to the issuance of the lease. The deposits of the other bidders will be returned upon acceptance of the successful bid by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

drilling wells; Hawkins field, 23; New Hope field, Franklin County, 7; Sand Flat field, Smith County, 6, and Powell District, Navarro County, 4.

EASTERN TEXAS WILDCAT FAILURES

Rains County: N. M. Massad 1 J. D. Whittle, Levi Welch Sur., 1 mi. N Point, elev. 515 ft., Woodbine 3,030 ft., dry, TD 3,934 ft.

Rusk County: L. O. McMillan 1 Frel Hamilton, J. I. Sanchez Sur., 3 mi. N New Salem, elev. 314 ft., dry, TD 4,190 ft.

ILLINOIS

Hamilton County Wildcats May Open Large New Field

MATTOON.—Most closely watched wells in the Illinois Basin during the past week were the H. C. Hageman et al 1 Tom McGee, SW NW NW 3-7s-5e, and the Dirickson et al 1 J. A. Flannigan, SW NE SE 28-6s-5e, both Hamilton County wildcats. These wells are about 1½ miles apart, with a producer drilled by Tide Water Oil Co. in 33-6s-5e located about midway between them. The 1 Flannigan, most northerly of the two wells, is about 1½ miles south of the Rural Hill field. Although no oil has been officially reported found in either of the wells, it is believed by many producers that they may open a large new field.

The 1 McGee is now waiting on cement with 7-in. casing set at 3,444 ft. through the McClosky encountered at 3,386-91 ft., total depth 3,450 ft. A 1-hour drill-stem test at 3,384-93 ft. recovered only 12 ft. of drilling mud.

The 1 Flannigan is drilling at 2,937 ft. From an elevation of 519 ft., the Glen Dean was topped at 2,631 ft., the Barlow at 2,910 ft., and the Cypress at 2,919 ft.

In White County, the B. M. Heath et al 1 Pyle Heirs, SE SE NW 12-6s-8e, wildcat between the Stokes and Brownsville fields, is being put on pump for a test of saturation found in the Rosiclare at 3,105-11 ft. Wayne County's prospective pool opener, the Deep Rock Oil Corp. 1 U. S. Spicer, SW SW NE 25-1n-5e, is pump testing the McClosky at 3,072-78 ft., total depth. It is reported making about 27½ bbl. of oil per day.

Illinois completions remained at a high level during the past week with 30 new producers and 22 dry holes reported. Included in these completions were seven wildcats, one a pool opener in Clay County. First reports totaled 39 and included 8 wildcats, 1 each in Coles, Richland, Wayne, Hamilton, Clay and Bond counties, and 2 in Lawrence. Coles County continued to hold its lead in the number of new operations with 13, followed by Richland with 6 and White with 4.

ILLINOIS SUCCESSFUL WILDCATS

Clay County: K. B. Drilling Co. 1-A Hastings, SW SE SW 12-4n-7e, pumped 25 bbl., Cypress sand 2,603-21 ft., TD 2,638 ft., PB 2,618 ft.

ILLINOIS WILDCAT FAILURES

Clay County: K. B. Drilling Co. 1 A. Traub, SE NE NE 13-5n-6e, dry at 2,963 ft., Aux Vases 2,736 ft., Ste. Genevieve 2,774 ft., Rosiclare 2,803 ft., McClosky 2,818 ft.

Clinton County: J. L. Girard 1 Laux, SE NW NE 7-3n-2w, dry at 1,253 ft., Glen Dean 845 ft., Cypress sand 1,028 ft., Paint Creek 1,093 ft., Benoist sand 1,140 ft., Aux Vases sand 1,199 ft., Ste. Genevieve 1,248 ft.

Effingham County: Dirickson 1 Flynn, SE NE NW 25-6n-7e, dry at 3,067 ft., Glen Dean 2,434 ft., Cypress sand 2,626 ft., Paint Creek 2,730 ft., Renault 2,846 ft., Aux Vases sand 2,862 ft., Ste. Genevieve 2,913 ft., McClosky 2,948 ft.

Marion County: National Consumers Oil Co. 1 N. Pickett, SE NE SW 16-2n-4e, dry at 2,853 ft., Glen Dean 2,179 ft., Hardinsburg sand 2,193 ft., Golconda 2,255 ft., Barlow 2,350 ft., Cypress sand 2,397 ft., Benoist sand 2,530 ft., Renault 2,575 ft., Aux Vases sand 2,607 ft., Ste Genevieve 2,669 ft., Rosiclare 2,694 ft., Fredonia 2,721 ft., McClosky 2,785 ft.

Shelby County: M. H. Richardson 1 Doll, SW NE NW 4-10n-6e, dry at 2,153 ft., Glen Dean 1,783 ft., Barlow 1,893 ft., Cypress sand 1,923 ft., Paint Creek 2,040 ft., Renault 2,081 ft., Aux Vases 2,087 ft.

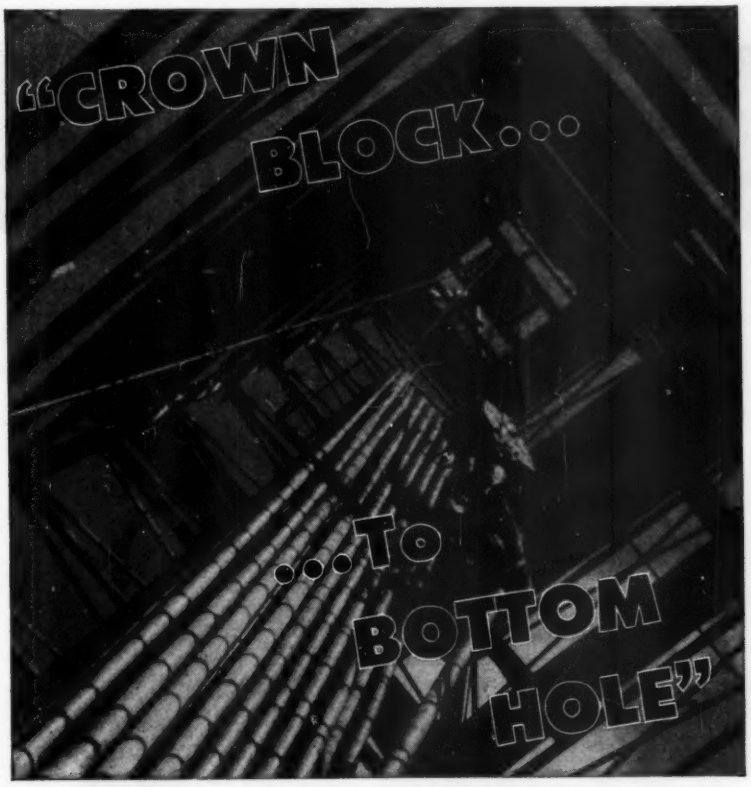
White County: Sun Oil Co. 1 Rebstock, NW SE SW 25-4s-9e, dry at 3,344 ft., Menard 2,395 ft., Tar Springs sand 2,526 ft., Glen Dean 2,597 ft., Barlow 2,852 ft., Cypress sand 2,887 ft., Benoist 3,023 ft., Renault 3,082 ft., Aux Vases 3,150 ft., Ste. Genevieve 3,179 ft., McClosky 3,300 ft., St. Louis 3,339 ft.

N. CENTRAL TEXAS

Free Oil Reported in Knox County Test

WICHITA FALLS.—Cities Service Oil Co. 1 Mrs. Doris Mulkey, Section 163, Block 44, H&TC Survey, Knox County wildcat 2 miles south of Truscott, drilled lime showing oil from 6,233-44 ft. On a 30-minute drill-stem test of the section, recovery was 280 ft. of free oil and no water. Bottom-hole pressure was 2,400 lb. in 10 minutes. It was drilling below 6,552 ft. in lime.

Continental Oil Co. 1 Lynn Garlington, Section 3422, TE&L Survey, Abstract 811, Montague County wildcat 1½ miles north



From top to bottom Republic provides complete financial service for the petroleum industry. If you are contemplating a loan to help you over a production hurdle, why not drop in and discuss your requirements with any of our officers. You will be met with a clear and sympathetic understanding. When additional funds are needed, remember Republic.

REPUBLIC

NATIONAL BANK OF DALLAS

CAPITAL AND SURPLUS $20,000,000 — LARGEST IN THE SOUTHWEST

of Bowie, ran a 45-minute drill-stem test from 4,082-4,195 ft. and recovered 2,250 ft. of salt water with no shows of oil or gas. It was drilling ahead below 4,360 ft. in shale and shells. Sun Oil Co. and Standard Oil Co. of Texas 1 Midkiff-Davis, S. Gann Survey, Abstract 411, deep test in the Sivell's Bend field of northern Cooke County, cored from 8,694-99 ft. and recovered 4½ ft. of gray dolomite, the top 2 ft. of which had an odor of oil. Another core from 8,699-8,703 ft. recovered 3 ft. and 4 in. of gray dolomite lime with no odor nor show of oil. On a 20-minute drill-stem test from 8,673-8,703 ft., recovery was 1,500-ft. water blanket and 60 ft. of drilling mud. It was drilling below 8,730 ft. in lime.

Electra field, Wichita County, had seven completions this week. Sivell's Bend field, Cooke County, and Holliday field, Archer County, each had three and Markley field, Young County, and Wilson field, Cooke County, each had two. Electra field had seven locations, Thornberry field, Clay County, five, and Madden field, Wichita County, four. Knox field, Young County, has seven drilling wells; Cooper field, Archer County, and Sivell's Bend field each six; Wilson field, Nocona field, Montague County, and National field, Wilbarger County, five each, and Hildreth field, Montague County, four.

In West Central Texas Noodle and Cooper fields, Jones County, each had one completion. Noodle field, Cooper field, Jones County Regular field, and Shackelford County Regular field each had one location. Stephens County Regular field has seven drilling wells, Shackelford County Regular field five, and Cisco field, Palo Pinto County, Palo Pinto County Regular field and Loving field, Stephens County, each have two.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Timberlake & Kelleher 1 Geo. F. Myers, Sec. 1, GH&H Sur. A-864, 5 mi. S and 1½ mi. W Holliday, elev. 1,037 ft., dry, TD 1,620 ft.

Cooke County: Hollandsworth Drlg. Co. 1 R. L. Trew, M. Langham Sur. A-564, 3 mi. S and ½ mi. E Myra, dry, TD 1,663 ft.

Haskell County: J. D. Hancock 1 J. R. Coody, Jr., J. G. Pitts Sur. A-339, 1 mi. E and 3 mi. S Haskell, elev. 1,428 ft., Palo Pinto 3,405 ft., dry, TD 3,502 ft.

Jack County: Kirkwood & Brader 1 Henry Cox, Lot 20, Blk. 1, Henderson CSL Sur., 1 mi. W Gibb Town, dry, TD 3,007 ft.

Hanlon-Buchanan et al 1 J. D. Gillespie, J. W. Colston Sur. A-3168, 5 mi. N and 1 mi. W Jermyn, dry, TD 645 ft.

Wichita County: James S. Smith 1 J. D. Padgett, SFIW Sur. A-278, 2 mi. N and 1 mi. E Burk Station, dry, TD 2,265 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Coleman County: Central Texas Gas Co. 1 J. C. Brown, Wm. Farris Sur. No. 279, 4½ mi. NW Trickham, elev. 1,529 ft., dry, TD 2,301 ft.

Woodley Petroleum Co. 1 Mrs. Bennie May Smith, Sec. 1, B&B Sur., ¾ mi. W Goldsboro, elev. 2,005 ft., Ellenburger 4,507 ft., dry, TD 4,704 ft.

Jones County: Pardue & Hilgerburg 1 S. B. Prothero, Subd. 3, E. C. Miller No. 2, 2¾ mi. SW Lueders, Saddle Creek 1,655 ft., dry, TD 2,053 ft.

GOING FISHING?

to catch that fish a good HOOK is necessary

When your fish is leaning into the wall or has fallen into a cavity or washout, a Big Four (Brauer) Hydraulic Wall Hook is the best means of straightening it up. Used below the overshot, this hook is safer because no strain is placed on the hinged joint when a hard pull is required to free the fish.

Many bad fishing jobs both in domestic and foreign fields have been cleaned up with these wall hooks where otherwise the hole would have to be plugged and the rig skidded.

Screwed to the bottom of the overshot, the hook is lowered below the top of the fish, and then lowered until it comes in contact with the fish. Then rotate hook right hand until fish is hooked. Hold tension on pipe and raise hook until entrance is above the top of the fish. Lower hook and overshot until top of fish strikes babbitt disc.

Available in a complete range of sizes for most A.P.I. tubing, casing and drill pipe. Complete information gladly furnished upon request.

BIG FOUR MACHINE AND SUPPLY COMPANY

MANUFACTURERS OF BRAUER PRODUCTS

Brauer Portable Drilling Rig . . . Brauer Standpipe Gooseneck . . . Brauer Drill Pipe Floats . . . Brauer Long Sweep Ell . . . Brauer Improved Release Valve . . . Brauer Hydraulic Wall Hook . . . Brauer "Slim Hole" Swivel

BIG FOUR MACHINE AND SUPPLY COMPANY

CLAY CITY, ILLINOIS

KANSAS

Wildcat Opens State's Ninth Pool This Year

THE ninth new oil pool has been opened this year by the successful completion of the Alkay Oil Co. 1 Gray, SW NE NE 11-24-13w, Stafford County. The well produced 480 bbl. in 24 hours from the Lansing-Kansas City lime at 3,774 ft. Total depth of the well was 3,882 ft. in the Viola lime, which was dry. Casing was set at 3,843 ft. and the hole plugged back to 3,774 ft. After the well was acidized with 1,000 gal., tests were made. The wildcat is 2 miles north and 1½ miles west of production in the St. John townsite pool.

Acid treatment failed to increase a ½-bbl. per hour show at 3,591 ft. at the W. P. Faulkner 1 Fischer, NW NW NE 8-21-13w, wildcat in Stafford County. The test is being drilled ahead below 3,607 ft. Nearest production is 1½ miles west in the Shaefer pool and 1½ miles south of the Hiss pool in Barton County.

Another wildcat for western Kansas is the Bennett & Roberts Drilling Co. 1 Bowser, SE SE SE 7-19-23w, Ness County. Operators are drilling below 400 ft. The test is 14 miles northeast of the Manteno pool which was opened last year.

Kansas reported 32 completions of which 4 were wildcats, 3 dry and 1 producer in Sumner County. Field completions totaled 28 with 19 oil, 2 gas and 7 dry.

KANSAS SUCCESSFUL WILDCAT

Sumner County: Ashland Oil and Bartlett 1 James, NW SW NE 36-32-2e, pumped 50 bbl. from Arbuckle at 3,472-74 ft., TD 3,477 ft.

KANSAS WILDCAT FAILURES

Rooks County: Ingling & Huber 1 Ordway, NW NW NE 20-10-18w, dry at 3,835 ft., Arbuckle 3,815 ft.

Tom Palmer 1 Lorbeer, SW SW SW 28-7-

19w, dry at 3,378 ft., Arbuckle 3,342 ft.
Russell County: Sharon Drilling Co. 1 Krug, NE NE SW 30-12-14w, dry at 3,268 ft., Arbuckle 3,191 ft.

MISSOURI WILDCAT FAILURES

Cass County: Charles Walters et al 1 Pickering Ranch, SW SW NE 29-46n-32w, dry at 2,572 ft.
Nodaway County: J. E. Palexky 1 Wallace, NW NW NW 10-65n-36w, dry at 2,211 ft.

MISSISSIPPI

Brookhaven Field Adds Another Oil Producer

JACKSON.—Another oil producer has been added to the Brookhaven field by the Roeser & Pendleton 1 School Lands, NW NW 16-7n-7e. After perforations at 10,391-10,413 ft., the well flowed 250 bbl. per day through ¼-in. choke. Perforations are being made in an upper sand between 10,315 and 10,344 ft. to test production from that zone.

Mississippi reported five completions. Two wildcats, one in Adams County and the other in Wayne County, were dry. Baxterville added one producer with an initial production of 194 bbl. and drilled to a total depth of 8,900 ft. The completion in the Cranfield field flowed 339 bbl. in 24 hours with a total depth of 10,361 ft. Tinsley was extended one well with the Union Producing Co. 22 Jennie Stevens. The well flowed 189 bbl. in 16 hours and was drilled to 5,831 ft.

MISSISSIPPI WILDCAT FAILURES

Adams County: Phillips Petroleum Co. 1 Davey, 330 ft. from northeast line of Lot 3 and 330 ft. from northwest line of 46-8n-2w, dry at 10,514 ft.
Wayne County: Humble Oil & Refining Co. B-1 Masonite, 1,780 ft. north and 660 ft. east of southwest corner of 21-9n-7w, dry at 8,500 ft., Comanche 6,400 ft.

FLORIDA WILDCAT FAILURE

Franklin County: Pure Oil 1 H. C. Lister, 466 ft. south and 1,850 ft. east of northwest corner of 17-7s-7w, dry at 4,976 ft., sand 4,835-55 ft.

OKLAHOMA

New Wilcox Pool Indicated In Old Seminole Area

A NEW Wilcox sand pool is in prospect for the western edge of the old Seminole area where J. F. Smith and Continental Oil Co. are running casing to test a saturated sand topped at 5,637 ft. in their wildcat, the 1 Klingensmith, SW SW SE 23-8n-3e, Pottawatomie County. Electric log indicated the sand section at 5,652 ft. and a core from 5,636-39 ft. recovered some green shale, 1 ft. of sandy dolomite, ½ ft. of dolomite with oil staining and a good odor, ½ ft. of green shale, and ½ ft. of soft sand with good saturation and odor. A drill-stem test at 5,632-39 ft. showed 2,880 ft. of 41° gravity oil with water.

Prior to the recovery of oil from the Wilcox, the 1 Klingensmith recovered about 100 ft. of oil from a saturated conglomerate in the basal Pennsylvanian at 4,902-12 ft., and about 400 ft. of oil along with mud and salt water from the Misener sand at 4,942 ft. and the Hunton lime at 4,956 ft.

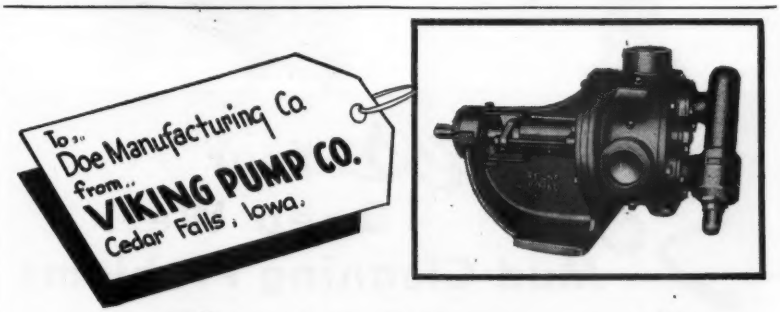
An unusual development in the Oklahoma fields during the past week was the finding

PRESSURE, TEMPERATURE, FLOW, ELECTRICAL AND LEVEL MEASURING INSTRUMENTS

UNITED STATES GAUGE

6 out of 10 manufacturers of original equipment specify U.S.G.

DIVISION OF AMERICAN MACHINE AND METALS, INC.
SELLERSVILLE, PENNSYLVANIA (14)



They're Yours... with a VIKING ROTARY PUMP

1: Simple—2 moving parts—"Gear Within A Gear" principle.
2: Positive and smooth discharge—no pulsation.
3: Only one outside packing box—to eliminate leakage.
4: Operates equally well in *either* direction.
5: Your choice of far more styles and sizes.
6: A completely engineered pump for *your* job.

Write for free Bulletin Series 3000T, showing Viking Pumps widely used today in the petroleum industry.

See Our Catalog In SWEETS

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

of a 5,000,000-cu. ft. gas sand at 425 ft. in Rogers County wildcat, the Charles P. Quinlan 1 Martin, SE SE SE 25-19n-16e. The well was originally started as a Wilcox test to go to between 900 and 1,000 ft., but blew out when the gas sand was encountered. A spray of 25 to 30 bbl. of oil per day was recovered along with the gas. Latest reports indicate that the well has been shut in successfully and operator is planning to drill ahead to the Wilcox.

T. H. McCasland has apparently opened good production in 19-1n-5w of Stephens County with two flowing wells. The 1 Payne, NE SW SE, found a sand at 2,920-41 ft. and pipe was set. After plug was drilled and the well cleaned, the well flowed at an estimated rate of 300 to 500 bbl. daily. The 1 Carnes, in NW SE SE of the same section, encountered the sand at 2,167-93 ft. and set pipe on top. On a drill-stem the well cleaned itself and flowed with a recovery of 1,250 ft. of oil and 150 ft. of oil-cut mud.

In Pawnee County, J. A. Turner et al 1 Summers, SW SW SW 34-21n-5e, encountered a Bartlesville sand showing oil from 3,346-3,400 ft. early last week. The well was drilled on to 3,620 ft. and an electric log was run, which indicated 68 ft. of stained pay in the Prue sand from 3,114-3,214 ft.

OKLAHOMA SUCCESSFUL WILDCATS

Okfuskee County: Wilcox 1 Hamby, SE SE NE 18-13n-10e, pumped 28 bbl. from Dutcher at 2,812-27 ft., TD 2,850 ft.

Stephens County: Skelly and Sun 1 Leslie C. Williams, SE SW NE 16-1s-4w, pumped 103 bbl. from sand at 5,416-68 ft., TD 7,158 ft.

OKLAHOMA WILDCAT FAILURES

Okfuskee County: W. M. Dunn 1 Gornley, NW NW SE 11-13n-10e, dry at 2,809 ft., Pitkin 2,787 ft.

Solves Your Deep Well Mud Cleaning Problems

The new and improved Thompson Model "DW" Shale Separator and Sample Machine will efficiently handle the flow of mud from the largest mud pumps now in operation. Shale and abrasives are removed, which means less wear and tear on costly drilling equipment. Attached Sample Machine is standard equipment, unless otherwise specified . . . field-tested method of obtaining accurate foot by foot samples of cuttings. Adopt the Thompson as Standard Equipment. There are two other models, each tailor-made to fit your requirements from the smallest to the largest well. Place your order through your supply dealer or direct to us . . . WE CAN DELIVER NOW!

★ SELF-MOTIVATED
★ RECONDITIONS MUD
★ ACCURATE SAMPLES
★ UNLIMITED CAPACITY

THOMPSON TOOL CO.
IOWA PARK, TEXAS

KEEPS DRILLING MUD CLEAN — PROVIDES TRUE SAMPLES OF CUTTINGS

LA.-ARK.

Nevada County Wildcat May Open New Field

SHREVEPORT.—The Charles F. Steele 1 H. L. Waters, N½ NW NE 20-14-21, wildcat in Nevada County, Arkansas, had a good show of oil at 1,207-19 ft. and 1,207-21 ft. After drilling to a total depth of 2,246 ft., the casing was perforated at 1,207-19 ft. An estimated 5 bbl. was bailed. The casing was again perforated at 1,207-21 ft. and 7½ bbl. heavy oil were bailed the first hour. Operators are waiting on standard rig.

The Salem Church field in Union County has been reclassified as a gas field by the Arkansas Oil and Gas Commission.

The Union Producing Co. 1 Belgard, NW 14-4n-3e, wildcat test in the Big Island area, Rapides Parish, had a good show in the Tuscaloosa massive sand at 9,770-9,802 ft. After running an electrical survey to bottom at 12,001 ft., operators are now plugging back.

Arkansas reported seven completions. The wildcat in Columbia County was dry. Stephens added three producers and Wesson one. McKamie and Haynesville each had one of the remaining two producers.

Completions in North Louisiana totaled 11 with the wildcat in Grant Parish completed as dry. Of the 10 field wells completed, 8 made oil and 2 were dry.

ARKANSAS WILDCAT FAILURE

Columbia County: McAlester Fuel Co. 1 W. H. Russ, SW SW 12-16s-20w, dry at 6,848 ft.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Grant Parish: California Co. 1 I. R. Richards, NW SE 11-18n-2w, 211 bbl. from Cotton Valley and Bodcaw sand at 9,097 ft. to 9,144 ft., TD 9,343 ft.

Florida Wildcat to Be Plugged Back for Test

TALLAHASSEE.—The O. D. Robinson 1 State, approximately N½ NW 29-59s-40e, Monroe County wildcat, has reached a total depth of 12,053 ft. and will be plugged back for a test of saturation found in cores between 10,180 and 10,319 ft.

The 1 State is actually located in Barnes Sound, 25 miles south of Miami, on a large block known as the Blanchard Concession. Saturation was originally encountered slightly below 10,000 ft. and cores from 10,180-10,250 ft. showed a large amount of free oil. A lower section of lime with low porosity and permeability, containing saturated streaks, was indicated in cores from 10,270-10,319 ft. A drill-stem test was attempted, but packer was so set that only a test of the lower section was obtained. Water and drilling fluid with no shows of oil were recovered and operators decided to deepen the well in search of additional saturation. The lower horizons proved disappointing, however, and operators now plan to run casing and tubing for a test of the upper section of saturated lime previously found. An attempt will then be made to swab the well in.

One other well is under way on the Blanchard Concession at present. It is the Gulf Refining Co. 1 State, located in the southwest corner of the concession on Big Pine Key. This well is now drilling below 6,200 ft.

Humble Oil & Refining Co. has completed a good well in the Sunniland field of Collier County. It is the 6 Gulf Coast Realties Corp., the third and best oil well in the state to date. For additional information on this well see Week's Highlights, page 151 of this issue.

OHIO, KENTUCKY

Oil Flow Reported From Two Perry County Wells

COLUMBUS.—John Morrow 1 Homer Skinner, Section 28, Madison Township, Perry County, filled up 1,600 ft. while drilling Clinton at 3,232-64 ft., and flowed 65 bbl. after shot. In the same township, Ohio Fuel 2 L. T. Harkness, Section 22, found the Clinton at 3,371-3,427 ft. and filled up 1,700 ft. before shot.

Another gas pool was discovered in Lorain County, Penfield Township. Ohio Fuel 1 Phillip Bobel, Lot 36, gaged 1,690,000 cu. ft. in the upper Clinton at 2,512-21 ft. An offset well will be started at once.

In the Ashland gas area, Ohio Fuel 1 Mathews-Echelberger, Section 13, Mifflin Township, Ashland County, gaged 2,030,000 cu. ft. natural. Clinton was found at 2,661-73 ft. The company is drilling two other wells in the same area.

The 29 locations reported for the week were scattered, Cambridge and Lancaster 6 each, Sandyville, Stewart and Brush Creek 4 each, Ashland 3, and Mt. Vernon 2. Ashland led in completions with 5 of 21, followed by Lancaster and Sandyville with 4 each.

OHIO SUCCESSFUL WILDCATS

Lorain County, Penfield Township: Ohio Fuel 1 Phillip Bobel, Lot 36, Clinton 2,512-21 ft., 1,690,000 cu. ft., TD 2,522 ft.

OHIO WILDCAT FAILURES

Perry County, Salt Lick Township: Pure Oil 1 J. A. Bailey, Sec. 7, Clinton 3,107-67 ft., TD 3,240 ft.

EASTERN KENTUCKY

ASHLAND.—Recent completions in Clinton County's new Highway field, 6 miles west of Albany, on the Burkesville pike, have added large wells to the field and greatly intensified the already active drilling campaign under way there. Latest well to be completed is the L. L. Morris 1 Clay Witham, a ½-mile northward extension, which flowed at the rate of 100 bbl. an hour through 2-in. tubing from the Trenton lime at 1,140 ft. The well was shut in as soon as 200 bbl. of available tankage had been filled, but it was estimated as good for between 2,000 and 3,000 bbl. daily.

The majority of the wells in this field have been completed in the lower Sunnybrook formation between 800 and 900 ft. Latest completion in this formation was drilled by A. G. Greenup and blew wild for 1½ hours before it could be capped. It was estimated to be flowing about 100 bbl. an hour from a depth of 831 ft.

The Highway pool was discovered last September by the Clarence Juist et al 1 Ora Hay, which caught fire and burned for 3 days before it oculd be extinguished. It was later gaged at 80 bbl. an hour. Since that time 19 producing wells have been drilled in the field, all with high rates of production. There are now close to 10 drilling wells. No pipe line outlet is available but one is expected to be completed in the near future. The nearest railroad is 50 miles from the field.

WESTERN KENTUCKY

OWENSBORO.—Sinclair Prairie 7 Humphreys, 6-P-21, Henderson County, shows promise of making another extremely good well for the area. Saturation was encountered in the Levias lime at 2,550-62 ft. and the well flowed 1,036 bbl. of oil natural in the first 24 hours. After casing was set and plug drilled, however, the flow stopped. As soon as rods and tubing had been run, the well once again started flowing and flowed 675 bbl. of oil and 10 bbl. of water per day. Total depth is 2,563 ft., and pump is now being installed at that depth.

Location has been staked for a wildcat test on a 3,000-acre block in Crittenden County by J. L. Kennard et al. The well is the 1 Rachel Etheridge, 10-J-18, located 11 miles southeast of Marion. Other first reports for the past week were development wells, one each for McLean and Henderson counties. Two dry holes, one oil well, and one gas well were completed during the past week. All of these were routine development wells, and no wildcats were reported.

INDIANA

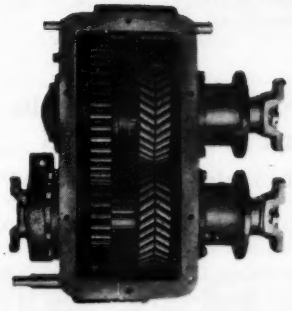
EVANSVILLE.—Continental Oil Co.'s deep test in the Griffin pool, 1-D Cooper Estate, SW SW SW 13-3s-14w, continued to drill ahead during the past week and was last reported drilling at 3,780 ft. Good showings of oil have been encountered so far in the St. Louis lime at 3,142-49 ft. and the Salem lime at 3,441-47 ft., and may be favorable indications of commercial saturation in lower horizons. The next possible pay strata is the Devonian lime which is expected at approximately 3,870 ft.

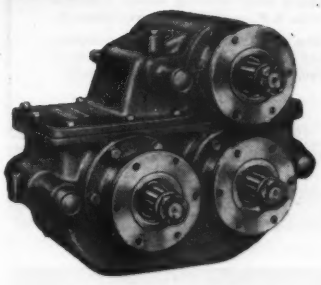
Indiana completions during the past week totaled six, three oil wells and three failures. No wildcat completions were reported. New operations included two starts in Gibson County, five in Posey, and one in Spencer.

Geology Group Plans Trip

The Tulsa Geological Society is sponsoring a field trip May 11 in eastern Oklahoma to study the Marmaton through Boone section. Guide books will be available.

DELIVERS
FULL ENGINE TORQUE





The Fabco Power Take-Off, illustrated at the right above, was designed especially for those applications which require a minimum wheel base, and where the power necessary exceeds the requirements of conventional take-offs mounted on the side of the main truck transmissions.

The Fabco Power Take-Off is mounted atop the Fabco Dual Drive Power Selector shown at the left. It consists of a special casting incorporating the take-off gears, shafts and bearings and replaces the standard transfer case cover. One model of the take-off delivers full engine torque at engine speed with outlet shaft running in engine rotation. A second model provides a reduced speed of 428 r.p.m. per 1000 engine r.p.m. A third model provides the same reduced speed but in opposite engine rotation.

Especially desirable in powering truck mounted compressors, generators, drilling rigs, and cranes—"power towers" installed in conjunction with Fabco Dual Drives can be used either "standing" or "walking."

26 Years in this Business

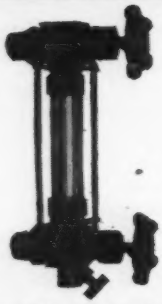
Fabco

F. A. B. MANUFACTURING CO.

1249 SIXTY-SEVENTH STREET · OAKLAND 8, CALIFORNIA

Dual Drives · 6 and 10 Wheel Units · Logging and Highway Trailers · Frame Extensions

PENBERTHY
"ALL IRON"
LIQUID LEVEL GAGES

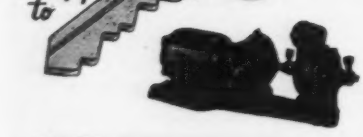


Body made from a special high strength alloy iron, shanks alloy steel and trim stainless steel. Extra heavy construction throughout, automatic and positive shut-off if glass breaks, heavy duty stuffing boxes. Conform with A.P.I.—A.S.M.E. requirements.

The "All Iron" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

BLACKMER PUMPS
The Key to



• LOWER PUMPING COSTS
• SUSTAINED PUMPING CAPACITY
• PUMP DEPENDABILITY

Write for Bulletin 102 PUMPS FOR THE PETROLEUM INDUSTRY . which explains why the "Bucket Design" (swinging vane principle) maintains pumping capacity by automatically compensating for wear and how the buckets, when finally worn out, are easily replaced and the pump restored to its normal capacity.

BLACKMER PUMP COMPANY
1940 Century Ave., Grand Rapids 9, Mich.

SERVING THE PETROLEUM INDUSTRY FOR OVER 40 YEARS
REFINERY PUMPS | BULK STATION PUMPS | HAND PUMPS

East Texas Salt Water Disposal Co. Expanding

DALLAS. — The expenditure of $500,000 is projected and partially under way by the East Texas Salt Water Disposal Co. to handle greatly increased salt water production in that field. Two complete units comprising treating plants, settling pits, and disposal wells will be added to the system, and new wells and plant equipment and field lines will be added to existing units.

During March and April, salt water production from connected leases increased 32,379 bbl. daily, bringing April's volume to a record daily average of 291,488 bbl. Under construction at the present time is the Frommer unit, which will handle 30,000 bbl. daily. It will include two disposal wells, and a 20,000-bbl. pit, the largest in the field. A second complete unit, the Hughes unit, has been approved by the board of directors and will add 15,000 additional barrels to the daily capacity of the system.

Producing Properties in East Texas Field Sold

Two sales of East Texas oil properties, involving the transfer of a total of 68 producing wells, have been disclosed.

Jenkins Oil Corp., Dallas, sold to A. F. Schubert, Dallas, and others its 51 per cent interest in 37 pumping wells on two leases in the Rusk County section of the field. Stanolind Oil & Gas Co. bought the remaining interest from W. B. Hamilton, Wichita Falls, and Continental Supply Co. A total of $1,850,000 was reported involved in payment for the properties, according to reports from Kilgore, Tex.

In Shreveport, La., Ben Beckham, Jr., sold his interest in Transo Oil Corp. to J. Frank Graham and his sons, Robert and Frank Graham, also owners of Peachtree Oil Co. The Grahams acquired 31 East Texas producing wells for a reported payment of $1,455,000.

Compact Meeting Set

OKLAHOMA CITY. — The Interstate Oil Compact Commission will hold its next quarterly meeting August 8-10 in Grand Rapids, Mich., according to Earl Foster, commission secretary.

At the meeting, the commission will discuss and take whatever action considered advisable on the subject of the Anglo-American oil treaty, Foster said. At its Tulsa meeting last month, the compact voted a recommendation of the resolutions committee to place the subject on the program for the next meeting. The executive committee is to study the agreement in the meantime.

Surplus Equipment for Sale

OKLAHOMA CITY.—Nearly $500,000 worth of excess government-owned surplus property, including such material as transformer oil, industrial engines, welding equipment, pressure regulators, and pipe, is being offered for sale on sealed bids by the Oklahoma City regional office of War Assets Administration.

Have you tried Rectorseal Recently?

Improvements developed to meet the severe requirements of the Armed Services has furthered the sealing qualities of RECTORSEAL. These laboratory tested and field proven refinements have been incorporated in the original formula which for seven years has been preventing leaks in threaded, gasketed and coupled connections for the Oil Industry.

If you haven't tried RECTORSEAL recently, get a can today and use it on all connections. Ask for it by name at your supply store.

RECTOR WELL EQUIPMENT COMPANY, Inc.
Fort Worth, Texas
Export: Lucey Export Corp., Woolworth Bldg., N. Y. C.

RECTORSEAL
THE POSITIVE LEAK PREVENTER

DECALS

Made with true, fast colors especially for application to oilfield equipment of every kind.

FOR OUTDOOR USE EVERYWHERE

Brilliant, Permanent Colors
Exceptionally Moisture-Proof
Unusually Tough
Quickly Applied
Permanently Affixed
Absolutely No Waste

Decals by SCREENCRAFT have been field-tested the world over

SCREENCRAFT CO.
P. O. Box 2166 Tulsa, Okla. U. S. A.

CALENDAR OF EVENTS

May

Southern California Meter Association, May meeting, Rio Hondo Country Club, Downey, Calif., May 16.

Panhandle Producers and Royalty Owners Association, annual meeting, Amarillo, Tex., May 16.

A.P.I. division of production, Southwestern district meeting, Washington - Youree Hotel, Shreveport, May 17-18.

Natural Gas and Petroleum Association of Canada, Windsor, Ont., May 22-23.

National Oil Scouts and Landmen's Association, Jackson, Miss., May 23-25.

June

Society of Automotive Engineers, semi-annual meeting, French Lick, Ind., June 2-7

Houston Nomads, River Oaks Country Club, June 4.

Pennsylvania Oil Producers Association, Bradford district, fifteenth annual meeting, Pennhills Club, Bradford, Pa, June 6.

A. P. I. division of production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, June 6-7.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette, Lexington, June 7-8.

Los Angeles Nomads, Mayfair Hotel, June 12.

A.P.I. division of production, spring meeting, William Penn Hotel, Pittsburgh, June 13-14.

Federal Power Commission hearing in the natural-gas industry investigation, Washington, June 17.

Canadian Gas Association, thirty-ninth annual convention, Murray Bay, Que., June 17-19.

American Society for Testing Materials annual meeting, Buffalo, June 24-28.

Pennsylvania Grade Crude Oil Association, twenty-third annual meeting, William Penn Hotel, Pittsburgh, June 27-28.

July

Houston Nomads, River Oaks Country Club, July 2.

Los Angeles Nomads, annual meeting and party, Mayfair Hotel, July 10.

August

Houston Nomads, River Oaks Country Club, August 6.

Interstate Oil Compact Commission, quarterly meeting, August 8-10, Grand Rapids, Mich.

American Institute of Chemical Engineers, western convention, Palace Hotel, San Francisco, August 25-28.

September

Houston Nomads, River Oaks Country Club, September 3.

Sixth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., September 9-11.

Los Angeles Nomads, Mayfair Hotel, September 11.

National instrument conference, sponsored by Instrument Society of America William Penn Hotel, Pittsburgh, September 16-20.

National Petroleum Association, forty-fourth annual meeting, Hotel Traymore, Atlantic City, N. J., September 18-20.

October

American Association of Oilwell Drilling Contractors, sixth annual meeting, Plaza Hotel, San Antonio, Tex., October 1-2.

Houston Nomads, River Oaks Country Club, October 8.

American Gas Association, annual convention, week of October 7, Atlantic City, N. J.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

November

Houston Nomads, River Oaks Country Club, November 5.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

December

American Society of Mechanical Engineers, New York, December 2-6.

Houston Nomads, River Oaks Country Club, December 3.

Los Angeles Nomads, Mayfair Hotel, December 11.

1947

January

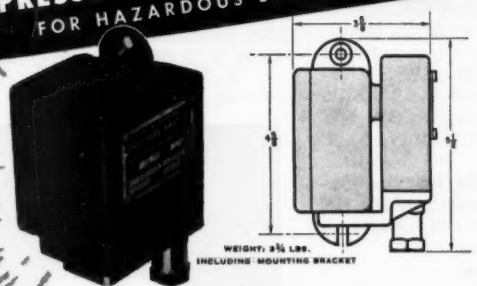
Society of Automotive Engineers, annual meeting and engineering display, Book-Cadillac Hotel, Detroit, January 6-10.

May

International Petroleum Exposition, Tulsa, May 17-24.

GEORGE A. STARBIRD EQUIPMENT

NEW EXPLOSION-PROOF PRESSURE OPERATED SWITCH FOR HAZARDOUS LOCATIONS



COMPACT—LIGHTWEIGHT

Separate housings for pressure and electrical controls make possible adjustments in the pressure system without disconnecting (or exposing) the electrical circuit.

Incorporates explosion-proof Micro switch, Underwriters' Listed for hazardous locations Class I Groups C & D, Class II Group G; these listings are for atmospheres containing vapors of ethyl ether, gasoline, alcohol, acetone, petroleum, naphtha, lacquer solvents, as well as natural gas and grain dust.

Electrical connection: ½-inch female pipe tap. Single pole, double throw switch. 10 amperes at 125 Volts A.C.

Pressure Connection: ¼-inch female NPT. Various models provide uniform pressure control from 25 to 2500 PSI. Minimum differential adjustment 20 PSI, maximum 200 PSI. Special applications requiring greater sensitivity should be referred to our engineering department.

Other George A. Starbird Pressure Operated Switches provide a complete line of pressure control from 30 inches of vacuum to 5,000 PSI.

LIST PRICE $50.00

PROMPT DELIVERY

ADDITIONAL DETAILS AND CATALOG FROM . . .

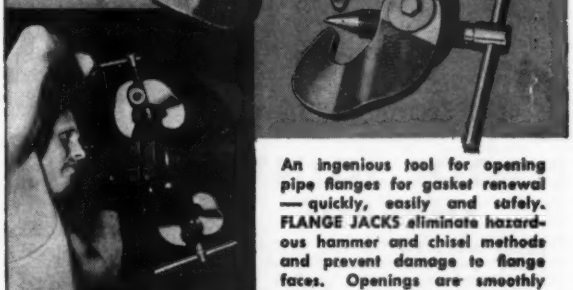
MELETRON CORPORATION

Manufacturers of GEORGE A. STARBIRD Equipment

950 North Highland Avenue Los Angeles 38 California

FLANGE JACKS

. . . eliminate costly gasket replacement shut-downs!



An ingenious tool for opening pipe flanges for gasket renewal — quickly, easily and safely. FLANGE JACKS eliminate hazardous hammer and chisel methods and prevent damage to flange faces. Openings are smoothly made against great pressures, yet flanges are held in perfect alignment. FLANGE JACKS save time, reduce accidents . . . make better seals possible.

WRITE FOR LITERATURE

Dept. D

T. G. PERSSON COMPANY

224 GLENWOOD AVE., BLOOMFIELD, NEW JERSEY

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

LONGER LIFE

for

TOOL JOINT THREADS

Jimmie Gray's 500 Ton Tool Joint Compound* puts a protective film on the threads which prevents galling and washouts . . . makes breaking-out easier. It withstands highest pressures; is unaffected by heat and moisture . . . will not harden.

"You Can Always Break the Joint"

SOLD BY SUPPLY STORES EVERYWHERE

Distributed by

STANDARD OIL SALES CO.

Houston 1, Texas

P. O. Box 293 Charter 4-5648

*Trade mark Reg. U. S. Pat. Off.

Among the

Drilling Contractors

Frank Seifert Drilling Co. will drill a wildcat in Allegan County, Michigan, for J. E. Hood. The well is the 1 Caroline Sesyskowski in NE SE NE 20-1n-16w.

Delta Drilling Co. is drilling at 12,395 ft. at the Humble 1 Freeman, in the John Little survey-A-37, Anderson County, Texas.

B & T Drilling Co. has the contract to drill the John Peters et al 2 Prichard, in SE SE 20-1n-16e, Falls City field, Richardson County, Nebraska.

Charles W. Cook Drilling Co. has the contract to drill the Leonard C. Sleep 1 Wright & Reynolds in NE SW SW 15-3n-13w, Allegan County, Michigan.

Cox Drilling Co. is rigging up cable at the Sun Oil Co. 1 G. Frisby Unit, in 20-O-22, Henderson County, Kentucky.

C. R. Craft Drilling Co. is the contractor at the Wm. P. Muller 1 Leo Frey in NW NE NE 1-1n-11w, Knox County, Indiana.

Robert W. Atha Drilling Co. has the contract to drill two wells in Michigan. The wells are the Gulf Refining Co. 1 Arthur Erno in SW SW SW 15-14n-6e, Bay County, and the M. Bliss Keller 1 Albert Anderson in SW NW NW 2-13n-4w, Isabella County.

J. Dunbar Drilling Co. has the contract to drill the 1 Specht in NE NE SW 7-10n-3e, for C. B. Mansfield in Shelby County, Illinois.

Whitaker & Co. will drill the Addison W. Warner 2 Carl Schmidt in NE SE 18-1n-8w, Pike County, Indiana.

Stuart Godfrey Drilling Co. will drill the P. F. Broughton 1 Henry Redder in SE NE SE 16-3n-13w, Allegan County, Michigan.

S. G. Walker is drilling superintendent for Justrite Drilling Co., Evansville, Ill.

M. I. Fillmore of K. L. Kellogg & Sons, California drilling contractor, who has been supervising operations in Ventura County, has been transferred to Bakersfield to take charge of some of Kellogg's operations in the San Joaquin Valley.

Apex Drilling Co. recently incorporated in Fort Worth with $50,000 capital stock, has elected C. M. Pearce as president.

Warren & Bradshaw Drilling Co. will drill the Texas Co. 1 J. L. Larkin, 330 ft. from south line and 1,011 ft. from west line of SW NW 16-6s-14w, Posey County, Indiana.

Ralph A. Gann, of Rocky Mountain Drilling Co., has moved headquarters from Los Banos to Lindsay, Calif., where the company has been contracted to drill a wildcat.

Gilbert P. Shoultz Drilling Co. has been contracted to drill the R. D. Brown, Inc., 1 Howard A. Dillon in SE SW 8-1s-9w, Pike County, Indiana.

L. & S. Drilling Co. is the contractor at the A. W. Cherry & Barron Kidd 1 J. J. Archibald estate in NE NW 29-16n-7e, wildcat in Richland Parish, Louisiana.

J. C. Means, Jr., Drilling Co. drilled the Sun Oil Co. 3 Reggan in the Egan field, Louisiana, to a total depth of 13,500 ft. in 86 days, which is consid-

B-W

Wall Cleaning Guides

Prevent Cement Channeling and Avoid Squeeze Jobs

WEB WILSON
Rotary Tongs

SAVE
YOUR
MEN

"IT'S A WILSON"

A truly one man tong. All operators agree our tong is easiest applied. Avoids accidents caused by fatigue. Ask the men.

See Composite Catalog
Pages 3101 to 3120.

WEB WILSON
Oil Tools
W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

VERNON-CORWIN
DESANDER

CLEAN MUD
PAYS OFF!

The VERNON-CORWIN Desander removes fine sand and abrasives from drilling fluid and reduces sand content to a minimum. Handles output of largest pumps. Helps prevent expensive fishing jobs. Easily installed, compact, portable. Write for Bulletin 124.

VERNON TOOL CO., LTD.
1101 MERIDIAN AVENUE,
ALHAMBRA, CALIF.

C. A. MUNCEY
1802 MAURY STREET, HOUSTON 10, TEXAS

ered an excellent time record for this depth. Contractor also has three rigs running in Texas. Two are for Sun Oil Co., of which one is at Nome and the other in the South Liberty field, Liberty County. The third rig running is for Humble Oil & Refining Co. in Smiths Point, Chambers County.

Carl Brooks Drilling Co. holds the contract at the Triangle Drilling Co. 1 Frierson et al in NW NE NW 34-14n-13w, Red River Parish, Louisiana.

Backers of Drake Memorial Honored in Titusville

TITUSVILLE, Pa.—Guests at a recent testimonial dinner sponsored by the Titusville Chamber of Commerce paid tribute to the group responsible for the establishment of the Drake Well Memorial Park with its library and museum.

Principal speaker was Dr. Paul H. Giddens, curator of the park, who reviewed the developments leading up to the founding of the memorial. Other talks were given by Charles B. Stegner, president of the Drake Well Advisory Board, and by Charles J. Ward, Chamber of Commerce president.

Dr. Giddens recalled that the directors of the American Petroleum Institute agreed to support the movement for the memorial in 1931 when they appropriated $60,000. Several years earlier, he said, a group of citizens led by the late John H. Scheide, James H. Caldwell, and others, started the work which resulted in the modern park.

Russell to Receive Award From Chemists Next Week

CHICAGO.—Dr. R. P. Russell, president of Standard Oil Development Co., will be presented the Gold Medal Award of the American Institute of Chemists at its annual meeting in New York, May 17. This award is made for his outstanding accomplishments as a chemist and chemical engineer and as an administrator of a huge research organization.

The presentation program is arranged for Friday evening, May 17, in the ballroom of the Biltmore Hotel. The medal will be presented by Dr. Gustav Egloff, president of the institute at the banquet given in Dr. Russell's honor. Before the presentation Dr. Warren K. Lewis, of Massachusetts Institute of Technology, will discuss "Russell as I Know Him." Maj. Gen. Alden H. Waitt, chief of the Chemical Warfare Service, U. S. Army, will speak on "Russell in the War Effort."

You can Reduce the Danger of Cementing Failure by always specifying and using

BAKER
Cement
Wash-Down
Whirler
Float Shoes

★ Floats the casing safely down the hole.

★ Whirls the cement *all around* the casing.

★ Drills out easily and safely.

Broken Pull Rods
Call For Only
One Man

. . . and
This Jack!

Simplex Pull Rod Jack No. 434 for shallow wells; 3-tons capacity. No. 440 for deep wells, 7 tons capacity, 22" take-up with one grip.

One man carries, operates Simplex Double Chain Pull Rod Jack which rapidly pulls together—in a straight line—broken rods on central powers or back crank units. No kinking or damaging. Speed crank takes up slack. Send for Catalog 45.

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

Templeton, Kenly & Co.
Chicago (44), Illinois
Better, Safer Jacks Since 1899

PERSONALS

Shell Refinery Head Spent 44 Months In Pacific

OF the hundreds of thousands of United States military personnel who served abroad during the war, only a relatively small number could equal the overseas service record of John L. Miller.

As a major in the Army's Service of Supply, Miller lacked only 4 months of spending 4 continuous years in the Pacific. He is now back at his old job as superintendent of operations of the Deer Park refinery of Shell Oil Co., Inc., near Houston.

He was commissioned in March, 1942, and shortly afterwards sent to Melbourne, Australia, where he was placed in charge of petroleum supplies for the Army Ground Forces. In 1944, he was made chief procurement officer in the office of the general purchasing agent for the Southwest Pacific Area handling supplies for all services.

Miller, who has 26 years of service in the Shell organization, started as a gager in the Wood River, Ill., refinery in 1920 and successively became assistant head stillman, assistant superintendent, superintendent at other Shell refineries until he was transferred to Houston in 1937. When he rejoined the company last December, P. E. Hurley, acting superintendent during Miller's absence, was made manager of Shell's Norco, La., refinery.

Lieut. Col. Donahue M. S. Langsworthy, Tulsa, associated with Gulf Oil Corp. 14 years before entering the Army in 1942, has been awarded the Legion of Merit for his services as secretary of the Army-Navy Petroleum Board. He is due to be released from the Army this month.

K. M. Regan, independent operator, was elected president of the Midland, Tex., Petroleum Club at its recent organization meeting. **R. S. Brennand, Jr.,** was named vice president, and **J. P. Gibbins,** secretary-treasurer. Directors are **John W. House, Tom Sloan, Ray Rhodes, H. A. Hemphill, H. J. Phillips, Robert L. Wood,** and the three officers.

R. P. Huggins, Western Gulf Oil Co.'s general manager, was honored by his associates recently at the Los Angeles University Club on his twenty-fifth anniversary with the Gulf organization. Huggins, a native Texan, entered Gulf's service in the accounting department at Houston in 1921. Those attending presented Huggins with a gold cigaret lighter decorated with an emblem symbolic of 25 years of service with the company.

Bowman Thomas, chief production engineer of Humble Oil & Refining Co., spoke on petroleum engineering problems in the development and producing branches of the industry at a meeting of the student section of the American Insitute of Mining Engineers at the University of Texas.

Floyd Bryant and **R. C. Stoner,** vice presidents of Standard Oil Co. of California, attended the company's first postwar safety meeting of the producing department in Los Angeles. **George Prussing,** safety engineer of Western Oil and Gas Association, was the principal speaker.

William Clawson, formerly assistant chief geologist for Magnolia Petroleum Co., has been made chief geologist, succeeding **S. A. Thompson,** recently named vice president in charge of exploration. Clawson has been with Magnolia since 1933.

J. L. Burke, traffic manager of Stanolind Pipe Line Co., has been made a vice president in charge of traffic.

N. Raymond Lamb, for the last 8 years in the geological and engineering departments of the Continental Oil Co., has joined the staff of the New Mexico Bureau of Mines and Mineral Resources as field petroleum engineer with headquarters at Artesia. He will study production problems of southeastern New Mexico fields, especially problems of secondary recovery.

Donald A. Morgan, formerly with the foreign division of PAW, has opened an office in Mt. Vernon, Ill., as a consulting geologist.

Thomas A. Terry, Jr., has joined the processing engineering department of the Baton Rouge, La., refinery of Standard Oil Co. of New Jersey, Louisiana division. Terry was with the former research and development department of the refinery from 1937-39. He was recently released after 46 months of Army service.

Robert B. Tucker, engineer at the Baton Rouge, La., refinery of Standard Oil Co. of New Jersey, Louisiana division, is back with the refinery following his release from military service.

John H. Matkin, engineer in the head office of Shell Development Co., has been awarded the Legion of Merit for his "distinctive and outstanding service" as an Army lieutenant colonel in connection with the toluene program.

Luther Davies has retired after 27 years of service with Standard Oil Co. of Pennsylvania. He was employed as a greasemaker in the Pittsburgh works.

Sherman L. Pease, technical assistant in the executive vice president's office of Shell Oil Co., Inc., has been made senior exploitation engineer for the company in the Los Angeles basin area. In other changes in Shell's West Coast production department, **Elmer Price** and **Roy E. Robinson,** drilling foremen in the San Joaquin division, and **William N. Roberts,** drilling foreman in the Los Angeles Basin, were transferred to the coastal division at Ventura. In Shell's manufacturing department, **John H. Minnick,** chemical engineer at the Wilmington refinery, has been shifted to the engineering department in the head office. In the Shell Chemical Corp. organization, **W. C. Dietrich,** technologist at Torrance, has been made an assistant department head

at Dominguez. Other changes include: **J. R. Minnich,** technologist at Torrance, made an assistant department manager at Torrance; **Robert R. Ray,** technologist at Martinez, transferred to San Francisco; and **R. W. White,** technologist at Torrance, made assistant department manager at Torrance.

Blake Middleton, European representative for Socony-Vacuum Oil Co., Inc., and a member of Socony-Vacuum's manufacturing committee, is currently in Paris.

Lloyd M. Ruef has been appointed to the post of technical assistant in the gas house of Standard Oil Co. of New Jersey's Bayway refinery. He is a graduate of Lafayette University and has been employed on the cracking coils.

Russell G. Hunter, former manager of the Wichita, Kans., office of Crane Co., has been appointed manager of the Tulsa, Muskogee, Okla., and Fort Smith, Ark., area for the company with headquarters in Tulsa. He succeeds **Frank A. Malatesta,** who is retiring after 42 years' service with the company. Malatesta became manager of the Muskogee office in 1910 and was shifted to Tulsa in 1926.

William B. Heroy resigned from the Petroleum Administration for War April 30 and is considering returning to the oil industry after an extended vacation. He served with PAW throughout the war, first as director of reserves and later as director of the foreign production division.

CLARK F. BARB

Clark F. Barb has been named to head the department of petroleum production engineering at Colorado School of Mines. **James O. Ball** has been chosen as head of the new department of petroleum refining engineering. The department of petroleum engineering of the school has been reorganized into the two separate departments. Barb is now head of the department of petroleum engineering and director of the petroleum research being conducted at the school under the Colorado Industrial Development Research program. Ball formerly was a refinery field engineer and designer for Standard Oil Co. of Indiana. For the past 2 years he has been consulting petroleum engineer with the Bureau of Mines in Golden, Colo.

George M. Musselman, former assistant division geologist for Carter Oil Co. at Jackson, Miss., has been transferred to Tulsa as assistant to **H. F. Moses,** vice president in charge of exploration; **C. B. Schwartz** succeeds Musselman at Jackson, and **Nathan C. Surber** of Jackson has been named district geologist for Mississippi-Alabama area.

Victor J. Martzell, Rosenbloom Pipe & Supply Co., has been elected chairman of the Ark-La-Tex chapter of the American Petroleum Institute in Shreveport. Other new officers for the 1946-47 term are: **O. W. Lyons,** Dowell, Inc., first vice chairman; **John P. Reynolds,** Sohio Oil Co., second vice chairman; **John T. Clarke,** Carter Oil Co., secretary-treasurer; and **H. Kirkpatrick,** Arkansas Louisiana Gas Co., program chairman. Members of the advisory committee are **Bert J. Dowd,** Union Producing Co.; **R. A. Seale,** Globe Supply Co.; **W. L. Stanton,** independent engineering consultant; and **T. W. McGuire,** Cotton Valley Operators Committee.

W. G. Warnock has been named manager of Mid-Continent Petroleum Corp.'s newly created materials department which combines the former general purchasing department and the priorities and inventory control department. Warnock has been manager of the priorities and inventory control department. **S. L. Gilliam,** company purchasing agent, will continue in that capacity. **J. Rex Wolfe,** former assistant to Warnock in the priorities and inventory control department, has been appointed superintendent of the inventories and materials division.

J. D. Jackson, Jr., Atlantic Refining Co., is returning to the United States after surveying oil possibilities in Colombia, according to information from Bogota.

L. B. Herring, Jackson, Miss., independent consultant of oil and gas properties, has been appointed manager of the oil and gas division of the Second National Bank of Houston effective June 1. Herring formerly was associated with Atlantic Refining Co., Marland Oil Co., and with an oil and gas consulting firm in Fort Worth.

D. R. Guinn, Cities Service Oil Co., Tyler, Tex., has been named president of the East Texas Geological Society. Other new officers are **T. H. Shelby, Jr.,** Humble Oil & Refining Co., vice president; **George Ely,** Continental Oil Co., secretary-treasurer. Guinn succeeded **G. W. Pirtle,** Tyler geologist.

T. E. Beaird, recently returned from Army service, has been named district engineer with Humble Oil & Refining Co. at Hawkins.

C. P. Bowie has retired as supervising engineer of the petroleum field office of the Bureau of Mines at San Francisco and will open a petroleum consulting office in San Francisco.

Paul A. Wolk, an operator in the Cut Bank field and accountant, has been elected president of the Montana Oil and Gas Producers Association, to succeed **Lon Crumley,** of Shelby. **W. E. Burks** was named first vice president and **Dewey E. Sandell** second vice president. **R. E. Svare** was reelected secretary and treasurer.

A. CALDERWOOD

A. H. Calderwood, former manager of the Wilmington, Calif., refinery, has been appointed manager of the manufacturing department in the San Francisco head office of Shell Oil Co., Inc. Calderwood replaces **Dr. Monroe E. Spaght** whose appointment to vice president of Shell Development Co. was announced recently. **R. W. McOmie** succeeds Calderwood as manager at Wilmington refinery and **L. R. Goldsmith** takes McOmie's place as superintendent of the Southern California plant. Shell's huge wartime expansion at Dominguez, including construction of the catalytic cracking plant and the toluene plant, was carried out under Calderwood's management.

F. W. Pierce has been reelected chairman of the board of Imperial Oil. **H. H. Hewetson** was reelected president, and **G. L. Stewart, O. B. Hopkins, and J. R. White** vice presidents. Other directors are **A. E. Halverson, F. C. Mechin, C. E. Carson,** and **F. G. Hall.**

Jean Capdeville, engineer, Societe Generale des Huiles de Petrole, Paris, France, and **Charles Deutsch,** engineer, Champigny, France, visited Plantation Pipe Line Co. in a tour to investigate pipe line transportation in the interests of the French petroleum industry.

George W. Lemaire, formerly with the Frontier Refining Co., and with Standard Oil Co. (New Jersey) at Aruba, Netherlands West Indies, has been appointed to the research staff of the Colorado School of Mines at Golden.

C. P. Porter, formerly division superintendent with Blackwell Oil & Gas Co., in East Texas, has resigned his position to become production superintendent of Snowden Oil & Gas Co., Ltd., of Dallas.

Dr. H. Gershinowitz, director of exploration and production research for Shell Oil Co., Inc., Houston, addressed the Dallas Petroleum Engineers' Club last week on "Industrial Research in the Petroleum Industry."

Equipment Men in the News

Ulmer Joins Drew as Technical Director

Dr. Richard C. Ulmer is now affiliated with E. F. Drew & Co., Inc., as technical director of the boiler water treatment division. He has been placed in charge of the technical and research aspects of the various water treating problems. Prior to joining Drew, Dr. Ulmer was associated for 9 years with the chemical division of the research department of Detroit Edison Co.

Bovaird Enters West Texas

With the building already under construction for a new store at Odessa to serve West Texas, Bovaird Supply Co. announces

L. W. BARTHELD

D. CUNNINGHAM

the appointment of L. W. Bartheld as district manager in the new territory and D. W. Cunningham as store manager.

Bovaird also announces that V. P. McAnally has just returned from the Army to his old job as district manager for Illinois which he left to enter the military service in 1942. McAnally entered the Army as a lieutenant, served 2 years in England and Europe, during which time he was elevated to the rank of captain.

Sterling Acquires Diesel Engine Rights From National Supply

The National Supply Co. of Pittsburgh and Sterling Engine Co. of Buffalo announces that the latter company has purchased the manufacturing and servicing rights to the high-speed diesel engines formerly produced at National's Superior Engine Division, Springfield, Ohio. The announcement was made by A. E. Walker, president of National, and Addison F. Vars, president of Sterling. Production of the engines will be taken over by Sterling as soon as tools and inventory can be transferred from Springfield to Buffalo, Vars said.

Widdell Elected President Of Arthur G. McKee

At the annual organization meeting of the board of directors of Arthur G. McKee & Co., Cleveland, April 16, H. E. Widdell was elected president. No other changes of officers were made. All directors of the company were reelected at the annual stockholders' meeting held prior to the organization meeting. Widdell succeeds Arthur G. McKee who has been president since the company's incorporation. McKee will continue to participate in the affairs of the company as chairman of the advisory committee of the board of directors.

Timken Announces Several Personnel Changes

F. R. MacFadyen has been transferred from the Milwaukee office to the Canton engineering department of The Timken Roller Bearing Co. as industrial engineer in which capacity he will act as assistant to S. M. Weckstein and Paul Haager.

Walter F. Green has been promoted to assistant manager and Joseph M. Roshong has been named superintendent of the division of research and development. Harley J. Urbach has been appointed works engineer, taking over the former duties of Green.

Eastman Appoints Jackson Vice President, General Manager

GORDON JACKSON

H. John Eastman, president of Eastman Oil Well Survey Co., has announced the appointment of Gordon Jackson, former chief engineer, as vice president and general manager of the Eastman organization.

Jackson has advanced through every phase of the company's controlled directional drilling and oil well survey work to the position of division chief engineer of the California division when, in 1945, he was made chief engineer. On January 1, 1946, he was made vice president and general manager of Eastman Instrument Co., manufacturing division of the parent organization.

Bruce H. Beesley has been named sales and service engineer for Eastman Oil Well Survey Co. in the northern and eastern Texas area. Beesley held a similar position in the Oklahoma area prior to entering the Army.

Pape New Manager of Branches for Jarecki

Jarecki Manufacturing Co., Erie, Pa., announces the appointment of W. Howard Pape to the position of manager of branches for their "Oil Country" distribution. He succeeds A. A. Moody, who has retired from the post, but who retains his interest in the affairs of the company, and will maintain offices in St. Louis.

Pape will make his headquarters in Houston. He comes to Jarecki from W-K-M Co., Houston, of which firm he was vice president.

Bowser Appoints New Tulsa Representative

G. W. COCKE

George W. Cocke, former district manager in Oklahoma for Erie Meter Systems, Inc., has joined Bowser, Inc., as representative in the Tulsa area, it is announced by Walter M. Harks, sales manager of the Bowser gasoline pumps and Petinco division. He will handle sales of marketing equipment and Petinco systems under the Bowser Dallas district office, and will make his headquarters in Tulsa at 216 East Archer Street, where both sales and service facilities are maintained.

New Houston Store and Warehouse for Republic

On a 14-acre tract in the Esperson industrial section, 501 North Greenwood Avenue, Republic Supply Co. has opened the first unit of its new Houston supply store and warehouse. This first part provides more than 37,000 sq. ft. of space, and the second unit, 75 by 300 ft., is now being designed, according to A. B. Judd, vice president and general manager of the company.

Some 1,200 oil men and oil-equipment manufacturers attended formal opening of the new building, and in addition, C. M. White, president of Republic Steel Corp., the parent company, and 10 other officials of the Cleveland office were at the opening.

Starting in 1910, Republic Supply Co. has expanded until today 45 sales and service points are maintained throughout Arkansas, Illinois, Indiana, Kansas, Mississippi, Louisiana, Oklahoma, New Mexico, and Texas.

Seitz Named to Engineering Staff of Foote Bros.

Foote Bros. Gear & Machine Corp., Chicago, announces the appointment of Raymond L. Seitz to the West Coast sales engineering staff. He will be located at Pasadena.

FOSTER CATHEAD CO. OPENS IN WICHITA FALLS

The manufacturing division of Foster Cathead Co. has opened in Wichita Falls and will produce the full line of Master breakout and Junior spinning catheads. Home offices are in Wichita Falls, with W. W. Foster, Capt. J. Lewis Foster, and Glenn E. Tedford as partners. The accompanying picture shows the plant.